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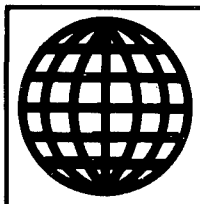

JPRS Report

Science & Technology

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ADVANCED MATERIALS

Functional Materials Research Center

90CW0143B Duesseldorf VDI NACHRICHTEN in German 26 Jan 90 p 16

[Article by vwd: "Universities Work Together; Center for Functional Materials Tailors Materials"]

[Text] The Ministry for Economics of Lower Saxony will support the newly founded Center for Functional Materials in Gottingen with 20 million German marks. The objective of the Center is materials research in the area of functional materials and the translation of results from basic research into practice. The managing directors of the research center which has taken the form of a private company (GmbH) are the Professors Herbert C. Freyhardt (University of Gottingen) and Barry Mordike (Technical University of Clausthal). In spite of the close relationship with industry, the research results are to be made available to all interested parties, claims the University of Gottingen.

Functional materials are materials with specific physical properties providing a key to innovation and progress in virtually all areas of technology. The combination of various electrical, magnetic or optical properties of individual materials with mechanical or chemical behavior can frequently only be implemented in a compound of several material classes. For precise applications in microelectronics, in electrotechnology and energy technology as well as in environmental technology, the research center wants to "tailor" such materials in the future.

In this respect, the scientists of the research center want to concentrate their efforts on the development of superconductors, metallic high-performance and light-metal alloys as well as compound semiconductors made of gallium arsenide and cadmium telluride. Additional projects involve compound materials, thin-film preparation, and laser surface treatment. In powder metallurgy, the expansion of physical analysis is to be supported. In addition, alternative methods for growing single gallium-arsenide crystals for electronic or high-speed microelectronic components is to be researched.

High-Performance Ceramics Research Association

90CW0143A Duesseldorf VDI NACHRICHTEN in German 26 Jan 90 p 16

[Article by vwd: "Focus on Baden-Wurttemberg; Joint Research Effort Strengthens High-Performance Ceramics"]

[Text]A joint research effort designated the "Ceramic Combine Karlsruhe-Stuttgart (KKS)" is now starting with the compilation of the scientific-technical relationships in the area of high-performance ceramics. Members of the Combine are the universities of Karlsruhe and Stuttgart, the Powder-metallurgy Laboratory of the Max Planck Institute for Metal Research in Stuttgart, the Institute for Civil Engineering and Construction Research of the German Aerospace Agency in Stuttgart, and the Fraunhofer Institute for Materials Mechanics in Freiburg. The objectives of the Combine, that, according to a bulletin of the Baden-Wurttemberg Science Ministry, comprises a significant portion of the ceramics research in the Federal Republic of Germany, also include a substantial increase in the teaching capacities and mutual support in the area of component development. The government of the Land has earmarked 4.5 million German marks each for 1990 and 1991 for the ceramics Combine.

The four main topics of the Combine in the area of research are the production of ceramic materials from organic preliminary stages; tribologic applications and ceramic joints; strength, fracture behavior and useful life; and materials with optimized transport properties that may become considerably more important in the areas of electronics, sensors and superconductors. One strong component of the concept is close cooperation with industrial users. At the University of Karlsruhe within the framework of the KKS, the "Technical Ceramics" practical training course is to be expanded and a graduate school that will offer a PhD degree in the area of ceramics science is to be started.

AEROSPACE, CIVIL AVIATION

Electron Accelerator To Speed Production at Aerospatiale

90CW0141A Paris L'USINE NOUVELLE in French 18 Jan 90 p 55

[Article by Pierre Laperrousaz: "Electrons Harden Composites"]

[Text]

Faster, More Flexible, and Cheaper than Thermal Curing

By using a high-energy electron accelerator, Aerospatiale will be able to cure composite parts in 1/10 the time.

Using electrons, it will soon take less than 8 hours to polymerize composite parts that previously required 4 days of kiln-curing. Aerospatiale has been planning ahead: The 10 mega-electron-volt electron accelerator the company plans to build at Bordeaux in collaboration with the Direction des Engins [Rocketry Division] will accommodate cylinders 4 meters in diameter by 10 meters long, mainly solid-propellant rocket motor casings, which are wound cylindrical structures made of composite materials reinforced with fiberglass, Kevlar, or carbon. The facility, to be placed in service in mid-1991, will be a pilot unit for aeronautic parts.

At the present time, there is really only one way to cure (or polymerize) composites: heat. Parts are gradually heated to more than 150° C, then slowly cooled. The cycle time for a cylinder 2 meters in diameter is more

than 100 hours. In the new facility, built around a CGR-MEV accelerator, the energy of the high-speed electrons will trigger the polymerization reaction in the resins. The acrylic resins used were specially modified for this application (high-performance biomaleimide resins are also being designed).

According to Aerospatiale, the process provides substantial savings on parts manufacturing costs. Cutting down the polymerization cycle time by a factor of 10 makes shop management easier and reduces the number of parts in production as well as the number of tools; tools are cheaper to make and last longer because they are no longer subjected to cycles of rising and falling temperatures. In addition, less resin is wasted or lost because since the resin will harden only under the action of the electrons, the fabrication of a given part can be stopped at any time and resumed later, while in the conventional process polymerization cannot be stopped once it has started, so a stop entails the loss of the part and the resin. The same feature makes it easier to clean machinery because the resin can no longer harden on it.

Aerospatiale is not launching this project out of pure speculation. And it is not the only company to take an interest in electron polymerization. Last year, Atomic Energy of Canada started a 10 mega-electron-volt pilot accelerator with a power output of 50 kilowatts (compared to 20 kilowatts for the Bordeaux facility). The energy determines the depth of penetration and the power output determines the required exposure time. For its part, the French company validated its process on the accelerator at the Corbeville Ionizing Radiation Applications Center, which produces 4 to 6 mega-electron-volts.

Studies started nearly 10 years ago helped to define the parameters for industrial installation and showed that the mechanical properties of the composites were equivalent to, and even better than, those of kiln-cured materials. Lastly, an innovative feature of the Bordeaux facility: It will process very thick composites (up to 30 cm) using X-rays obtained by placing a target across the electron beam, at the expense of curing time.

Eutelsat Developing Terrestial Tracking System for Europe

90MI0112 Rome AIR PRESS in Italian
15 Dec 89 p 2383

[Text] Telespazio has been awarded a contract by Eutelsat, the European organization for telecommunications via satellite. The contract involves using the Lario ground station as a supporting network to enable Eutelsat to carry out demonstrations of the European mobile ground system via the Euteltracs satellite. According to a statement released by the company to AIR PRESS, demonstrations will begin in January 1990 and will continue for six months.

The Euteltracs service determines the position and the exchange of messages between mobile ground units, such as transport and rescue vehicles. It uses Omniracs technology, developed and marketed in the United States by Qualcomm, and can operate throughout Europe by using the potential available on the currently operational Eutelsat satellites. These demonstrations will make it possible to assess the operational and commercial potential of this service. A number of European transport companies have already stated that they intend to take part in this demonstration project with a view to using the service as soon as it becomes operational. In June and July, Eutelsat carried out a series of tests to assess the technical features and the overall reliability of the Euteltracs system together with a number of signatories and Qualcomm. The tests were performed in seven European countries under different climatic and road conditions, and proved the technical and operational effectiveness of the system, which will now undergo more extensive testing.

ESA Studying Space Station for 2002-2006

90MI0081 Rome AIR PRESS in Italian
24 Nov 89 pp 2246-2247

[Text] Europe is developing a series of four space stations to be put into earth orbit after the year 2000 at a given point between the earth and the moon. As reported in a note by ANSA, these stations will be real 'spaceports' around the moon and Mars, as manned transfer vehicles will be able to land on and take off from such stations to explore the moon and Mars. ESA [European Space Agency] has assigned responsibility for the design of the astronauts' accommodation in the 'spaceports' to Italy, and it will be carried out by Aeritalia. The project was announced by Aeritalia itself. The first element of the 'spaceport,' to be launched by the future Ariane-5, will be in earth orbit in the year 2002. The station is expected to accommodate a permanent crew of at least three by the year 2006. At that time, the 'spaceports' between the earth and moon (at approximately 300,000 km from earth) will be completed, as will the lunar orbit 'spaceport' that will make it possible to explore our natural satellite in conjunction with the base established on the moon by the United States. In fact, the series of European 'spaceports' is part of a joint European-U.S. program for exploring the moon and Mars.

FRG: Dornier's Aerospace Projects Outlined

New Fiber Composite

90MI0105 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German
No 516, 30 Nov 89 pp 10-11

[Text] Dornier GmbH, a Deutsche Aerospace AG company, has developed a new sophisticated processing method for materials to be used for the production of structural aircraft components in carbon fiber-reinforced thermoplasts (CF/PEEK [carbon fiber/polyethylketone]) as part of a research contract awarded by the FRG Defense Technology and Procurement Agency

(BWB). The new CFP [carbon fiber-reinforced plastic] material, which was first used for the cockpit profile of an Alpha jet horizontal stabilizer, has successfully satisfied the comprehensive flight requirements laid down by the official licensing office, with the result that the component can now be tested in regular flight operation.

For the conventional processing of carbon reinforced fibers, these are woven into strips and impregnated with plastic resin components. The technical name for these preimpregnated fabrics and mat's is CFP- prepreg semi-finished material. Epoxy resins, which belong to the duroplast group, are the most widely used as resin components (matrix) in prepreg production. Various types of resin can be mixed, according to the properties required, thus creating a matrix system.

For the new CFP material Dornier has used a matrix system that does not consist of duroplasts, but uses modern thermoplasts. CFP-prepregs with a thermoplast matrix present, for example, improved impact resistance, higher tensile strength, improved corrosion resistance, and higher temperature resistance than duroplastics. In contrast to duroplasts, thermoplasts can be repeatedly remelted and can be molded, welded, or deep-drawn like metals. As thermoplast prepregs are not adhesive and therefore cannot be draped over molds, the Dornier materials engineers explored new production and processing methods, successfully testing both the autoclave and remolding methods. Production cycles are considerably reduced, with the help of beams or hot gas equipment according to the size of the component, and when compared to the processing of fiber-reinforced duroplasts. The advantages of using raw CFP materials in aircraft construction include weight reduction, improved fatigue and corrosion performance, and reduced service and maintenance costs. Fiber-reinforced thermoplastics will gain increasing importance in the future. Bonding techniques such as welding and riveting make for economical, automated production processes.

Cluster Satellites Project

90MI0105 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 516, 30 Nov 89 pp 14-15

[Text] The ESA [European Space Agency] has appointed Dornier GmbH of Friedrichshafen as the main contractor for the development of a series of four satellites for the CLUSTER solar-terrestrial research project. The contract awarded to Dornier for project planning is worth approximately 27 million Deutsche marks [DM] and will run for 16 months. This will be followed by the production, final assembly, and testing phases costing approximately DM320 million and running for 51 months. Dornier will subcontract work to other European and FRG companies in proportion to the budget shares contributed to the CLUSTER project by the various ESA member states. The four identical research probes are scheduled for launch in December 1995 with an Ariane-5 launcher. This is also the first ESA project in which four satellites will be sent into space simultaneously.

The sun's plasma flow—a completely ionized gas, also referred to as solar wind—crosses the solar corona into space and collides with the magnetic field of the Earth at very high speed. The solar wind and the heavily-loaded plasmas generated in the magnetic field of the Earth begin a complex interaction that contributes to the formation of the extremely long trail of the terrestrial magnetic field. Because of their magnetic fields, magnetized plasmas do not blend easily with one another in space, but remain separated by a thin current layer [Stromschicht], and transitions only occur in certain regions under specific conditions.

The scientific goal of the CLUSTER mission is to study these complicated processes, which vary in both space and time, at the point where the solar wind and the geomagnetic field meet. The four CLUSTER satellites will use near-earth space as an enormous laboratory, in which plasma physics phenomena can be examined in their actual three- dimensional relationship.

After assembly has been completed by Dornier, all four research satellites will be set on a subequatorial orbit. Each satellite has its own main propeller which launches it into the prescribed, markedly eccentric, subpolar orbit. The probes, which are spin-stabilized at five revolutions per minute, are approximately 1.30 m long and 3 m in diameter and weigh approximately 1.1 tonnes each. Electrical energy is supplied by solar cells mounted on the outer casing of the satellite. Scientific payloads for various field and particle experiments are incorporated in the research probes. Over a two-year period the satellite fleet will examine all the important regions of the magnetosphere. Therefore, the distance between the probes must adjust to the fields to be studied, from several hundred kilometers on the side of the magnetosphere facing the sun, to a distance of a few Earth radii in the area of the Earth's magnetic trail. Four smaller position stabilizing engines are responsible for positioning the satellites in relation to each other. The CLUSTER project is part of the ISTP (International Solar Terrestrial Program) international research program that studies solar- terrestrial interactions in the solar-Earth system.

Italy Increases Participation in Helios Satellite Project

90MI0128 Rome SPAZIO INFORMAZIONI in Italian 15 Jan 90 pp 4- 5

[Text] Italy has decided to play an important financial and technological role in the development of a new generation of military observation satellites. The satellite will substitute the Helios series and is currently being studied in the framework of a trilateral cooperation agreement between France, Italy, and Spain. These statements were made by General Secretary of Defense and

National Director of Arms, Gen. Luigi Stefani in a recent interview published by PANORAMA DIFESA.

General Stefani stated: "Italy has a 14 percent participation in the Helios program along with Spain and France. Our country did not take part in the program from the beginning, but after it had been launched by France. This explains our modest share in the program as well as the concentration of Italian industrial activity in the ground segment, which is certainly not the most valued segment from a technological point of view. On the other hand, the satellite had already been defined, and it was no longer possible to take part in the development of the platform and payload." He continued, "The Helios satellite is equipped with optical sensors but its operations will be limited. The main limitation is that its operations are determined by the atmospheric conditions in the area it is observing. A successor is already being considered to overcome these limitations by developing an instrument that can carry out reconnaissance under all weather conditions. Italy intends to play a decidedly larger role in this new generation Helios satellite, both financially, and above all technologically, by contributing its specific know-how in satellite, infrared, and radar sensors. Stefani concluded by saying: "The general picture should remain a French-Spanish-Italian collaboration, with a strategic interest focused on Europe and the Mediterranean."

Italy's Microtecnica on Schedule with Satellite Electronics

90MI0110 Rome AIR PRESS in Italian 3 Jan 90 p 32

[Text] On the basis of a contract with Aeritalia, Microtecnica has developed two electronic control units for the Lageos-2 satellite's platform. The platform will be used to transmit a stabilizing rotary motion to the Lageos-2 satellite prior to its launch on the NASA shuttle.

Two years ago, Microtecnica completed the mechanical structure of Lageos-2 in compliance with the precision standards imposed by the design specifications and delivered it to Aeritalia for the application of retroreflecting prisms. The July 1988 delivery of the rotating platform has now been completed with the delivery of the control units. Together, they form an essential part of the IRIS (Italian Research Interim Stage) space system. Both electronic control units were sent to the ESA's (European Space Agency) technological center in Noordwijk, the Netherlands and were integrated in IRIS for testing under thermovacuum conditions.

The space mission's requirement for security and redundancy calls for both electronic control units in the system, even if a single unit would be sufficient to regulate the rotating platform. The control units are the result of extremely advanaced electronic engineering and are completely identical. Each is designed to function at temperatures ranging from minus 40 degrees to plus 70 degrees centigrade, and regulates an electric brushless motor on the four quadrants by allowing it to accelerate or decelerate in the two directions of motion.

The units are fed by a 28 nominal volt direct current. The power bridge uses extremely high-speed switches which transmit currents of up to 60 amperes at a frequency of 50 KHz. During the mission, a three- part communication starts between the rotating platform (with its velocity and position sensors and electric motors), the electronic control units, and the IRIS control and general coordination subsystem, which then communicates with the shuttle's general computer. This continuous exchange of information on the mission's changing environmental conditions, together with the satellite's physical characteristics and the shuttle's position, enable each of the Microtecnica-designed and built electronic control units to place the platform in motion and accelerate or decelerate the rotary motion so that the satellite achieves optimal in-flight stability. After launching the platform can be returned to its initial departure position.

Italy: Selenia Spazio's Future Projects Discussed

European Satellite Programs

90MI0101 Milan ITALIA OGGI in Italian 18 Dec 89 p 14

[Interview with managing director of Selenia Spazio, by Susanna Petruni of ITALIA OGGI: "We Are Aiming at European Leadership in the Satellite Sector;" date and place not given]

[Text] A large step forward for Selenia Spazio. The IRI [Institute for the Reconstruction of Industry]-Finmeccanica company, which develops large-scale electronic equipment and is in the forefront in the construction of telecommunications and telesurveying satellites, expects its orders to increase from 250 to 750 billion lire over the next five years. In this interview with ITALIA OGGI, Managing Director Andrea Pucci outlines the company's plans for 1990 (in 1988 the company's earnings totaled 218 billion lire).

Selenia Spazio holds a leading position in the international space race and relies on government funding to keep up with foreign competition. According to Pucci, prompt decisions must be made regarding direct TV transmission via satellite and a decision must be made on the Sarit program by 1990. In the field of space networks, Selenia Spazio aims at gaining a leading position in the ESA's [European Space Agency] Sat-2 and Data Relay Satellite (DRS) programs, which combined are worth approximately 1,600 billion lire, with the support of the Ministry of Scientific Research. **Petruni:** Telecommunications satellites are one of the strong points of your company strategy. What are your plans for 1990? **Pucci:** A decision will have to be made regarding direct TV transmissions via satellite in 1990. By the end of 1990 Italy must also approve the Sarit program, which should be completed by 1993. Sarit will replace the Olympus satellite launched in July 1989 and scheduled to remain operational until 1994. RAI [Italian Broadcasting Company] has no choice but to launch another

satellite into orbit if TV transmissions from space are to begin. Italsat, the first national telecommunications satellite developed for the ASI, the Italian Space Agency, will also be launched in 1990.. **Petruni:** What are your commitments in the European telecommunications sector? **Pucci:** At the moment we are waiting for ESA to approve the Sat-2 project, which involves the development of a telecommunications satellite. Our second project is the DRS, another program developed by the European Space Agency, which involves the construction of an integrated space telecommunications system. These two programs will bring a new age in communications via satellite by developing a real space network from the ground support network. Basically, this means a group of satellites, that will interact in space and transmit data to the ground stations. **Petruni:** What does acquiring the leadership of the Sat-2 and DRS programs mean for Selenia Spazio? **Pucci:** It is a basic step which will pave our way into the European market for the next 10 years. With this move Italy will acquire European leadership in the field of telecommunications satellites. **Petruni:** The order has not been placed yet and the matter is far from being settled. What makes you feel so confident? **Pucci:** The prospects are good for the time being. Scientific research minister, Antonio Ruberti, is firmly determined to support this request for Italian leadership at the EC level. Nonetheless, the whole matter must be followed carefully. **Petruni:** The satellite market is booming. How will your business expand in the wake of this growth? **Pucci:** We expect our orders to triple—from 250 to 750 billion lire—over the next five years. **Petruni:** Telesurveying satellites are also involved in the "space race." How is Italy faring in the competition? **Pucci:** At the moment, we are somewhat ahead of our European competitors. However, the financial burden and research on the new generation of microwave telesurveying satellites cannot be borne by one company. It is up to the government to decide whether to carry on with the program or not. If so, the annual investment will range from 50 to 100 billion lire. However, unless a national plan is developed, we shall no longer be competitive in this sector in 10 years' time.

International Satellite Programs

90MI0101 Milan ITALIA OGGI in Italian
18 Dec 89 p 14

[Text]

Box, p 14

Selenia Spazio expects to consolidate its position both in the domestic and the international marketplace over the next few years. In Italy, besides carrying out specific activities in support of the National Telecommunications Plan, the IRI company will be involved in the SICRAL project. This project involves a telecommunications system for the armed forces and for civil defense (for which some 1,000 billion lire have been allocated through 1996). As for foreign markets, apart from the company's commitments with the European Space Agency, Selenia Spazio is attracted by the 5,000 billion lire to be allocated for the 40 commercial satellites that are scheduled for launching by the year 2000. In particular, the state-controlled company aims at acquiring orders for international satellite programs for Intelsat and Inmarsat; Eutelsat and Eumtelsat (Europe); Rascom (Africa); Morelos and Brasilsat (Latin America); Iransat (Middle East).

Italy: Elsag, Aeritalia Sign FMS Agreement for EFA

90MI0087 Rome AIR PRESS in Italian
1 Dec 89 p 2285

[Text] Elettronica San Giorgio Elsag of Genoa and Aeritalia have reached an agreement for the supply of a turnkey FMS (flexible manufacturing system) to be used for the manufacture of primary aircraft structures at Aeritalia's Turin-based defense aircraft group. The order that Aeritalia has placed with Elsag involves a flexible manufacturing system that will be used in the development of the EFA [European Fighter Aircraft] program, the European defense aircraft of the future.

As part of a consortium of European companies, Aeritalia will manufacture 21 percent of this aircraft, and in particular the wing, whose sophisticated technology features the use of structures in composite materials. According to a statement by the two companies, Elsag will act as project leader and systems integrator for the equipment and software, which will be manufactured according to precise specifications. The company's role will therefore be to coordinate and integrate the various hardware and software suppliers, using methods specifically designed to cover every aspect of automation of the mechanical production process.

Aeritalia and Elsag have already signed other agreements of this kind, such as Elsag's development of a DNC (direct numerical control) system to connect several numerical control machine tools.

Italian Space Agency's Future Projects Discussed

90MI0085 Milan ITALIA OGGI in Italian
25-26 Nov 89 p 41

[Interview with Italian Space Agency President, Luciano Guerriero by ITALIA OGGI correspondent Michela Fontana]

[Text] The Tethered Satellite, IRIS [Italian Research Interim Stage], Lageos, the Columbus Space Station, and New Telecommunications Satellites. Cooperation with NASA and ESA (European Space Agency), Bilateral Agreements with European countries, and New Scientific Cooperation Agreements with the Soviet Union.

ASI (Italian Space Agency) is intensifying its activities a little more than one year after its establishment, at a time when the two great space powers, the United States and

the Soviet Union, are cutting their space research budgets, particularly where the more ambitious projects such as the orbiting station Freedom are concerned.

Luciano Guerriero (for years the head of the Italian Space Program) is the president of ASI, which is directed by Carlo Buongiorno. ASI coordinates all the space programs in which Italy is involved, programs that have become an important part of industrial activities as well as an instrument for scientific research and the experimentation of new technologies.

It has been calculated that, in only the more developed areas of space research, approximately 300 particularly sophisticated missions will be carried out worldwide by the end of the century. The turnover, amounting to tens of billions of dollars, is destined to grow and the private sector will become increasingly involved. We asked Luciano Guerriero to provide an account of the agency's activities this year and to comment on its plans for the future. **Fontana:** What is the situation of the new Italian agency? **Guerriero::** Our current difficulties concern the number of personnel, which is still insufficient. We are waiting for the ministries of the treasury, research, and the civil service to approve the agency's regulations. Nevertheless, the results of our work are good. Last year we handled highly intensive work that required 800 billion lire in funding. **Fontana:** How will programs in cooperation with NASA develop? **Guerriero::** The first satellite to be launched into orbit by the space shuttle will be the Tethered Satellite in 1991 with an Italian astronaut aboard. Again in 1991, the Lageos satellite will be launched by IRIS, an auxiliary booster created by a group of companies in our country. In 1992, the SARC X will be launched. This is an earth observation system with active microwaves, created in cooperation with the Netherlands. The SAX [X-ray astronomy satellite] satellite will be launched in 1993. **Fontana:** And what about cooperation with ESA? **Guerriero::** Participation in ESA has always been very intense. We are involved in projects for the Columbus space station, the Ariane launcher, Hermes, Eureca [European Retrievable Carrier], and the Data Relay Satellites telecommunications projects. **Fontana:** Are there cooperation agreements with the Soviet Union as well? **Guerriero::** We are currently defining an operating agreement with the Soviets which will be signed in Rome. This will involve cooperation relating to scientific experiments in astronomy, astrophysics, and planetology. **Fontana:** Will work robots be constructed in the space technology field? **Guerriero:** Space robotics is important because man should only go into space when absolutely necessary, to carry out experiments or conduct special maneuvers that would not be possible with a machine. ASI has launched a project called SPIDER [Space Inspection Device for Extravehicular Repairs] for the development of a space vehicle with robotic capabilities. It will be equipped with sensors and actuators to carry out maintenance and inspections. We decided however, not to invent anything new in robotics for space but to construct simple systems that can evolve over a period of time along with technological progress. Italian industry, however, has great capabilities in this sector.

Italy: Databus Transmission System for EFA

90MI0066 Rome AIR PRESS in Italian
17 Nov 89 pp 2183-2186

[Text] The structure and a number of components of the European Fighter Aircraft's [EFA] new standard data transmission (databus) system were presented by Technitron System, jointly with Selenia's Defense Systems Division, to representatives from industral companies in the sector and to the AMI [Italian Air Force] during the first national technical conference on STANAG 3910 fiber-optic databuses. The conference represented an opportunity to examine the state of research on the development of systems for the European Fighter Aircraft. The new standard, whose specifications have been issued by the Eurofighter consortium (Aeritalia, BAe [British Aerospace], MBB [Messerschmitt Boelkow Blohm], and CASA [Construcciones Aeronauticas S.A.]), is designed to replace the former MIL-STD-1553 [Military Standard 1553] currently in use on all U.S. and Western-made aircraft (with the exception of French aircraft, which use a national standard).

The databus is the system that transfers data among the various computers on board the aircraft, and interfaces and presents the data on the cockpit instruments in an analog or digital form. For example, in modern aircraft the flight commands (fly-by-wire), navigation and attack systems, weapons, radar, and passive electronic warfare systems are controlled and managed by computers. This demonstrates the amount of data that must be transmitted among the various components of the system and presented to the pilot to carry out the mission.

The MIL-STD-1553, developed approximately 20 years ago, has a one- MBit/second processing capacity, a rate that refers to the speed of data transmission. The control system for the flight commands, which are entirely fly-by-wire (via optical fiber) on the EFA and all new generation aircraft, is capable of creating artificial instability to enhance the efficiency characteristics of the aircraft in the more difficult maneuvers. This instability can be controlled by computer only, as the pilot would be neither materially nor physically equipped to control the aircraft under such operating conditions.

In view of these needs, Eurofighter drew up the requirements for the new STANAG 3910 databus. In general terms, this system is a development of the 1553, which has been combined with a new fiber-optic data transmission system. In practice, the 1553 will act as a low- speed interface unit for data that does not require the superior performance of the 3910, while the new system will act as a high-speed interface unit. With this configuration the new STANAG has a 20- MBit/second capacity and can therefore transmit data much more rapidly than the 1553. The work done by Eurologs, a consortium formed by Selenia, GEC Avionics, Inisel, and Siemens (as the

successor to the consortium that worked on the Tornado's electronic system) is part of this picture. Its goal is to develop the architecture of the entire system including ground support (test stands and maintenance/repair of the various components). STANAG 3910 is modular and equipped with very flexible software. The completion of test stands is fundamental to the development of the 3910. In fact, the development of the system, which is currently one of the most advanced in the fields of computer science and physics, can proceed only if the data is continually checked. If the support program that Eurologs has submitted to the Eurofighter consortium is adopted, the Italian, FRG, British, and Spanish Air Forces will be able to equip themselves with a standard maintenance and test stand complex at a cost significantly lower than that of current systems. In fact, the avionics system of every different type of aircraft currently requires dedicated test stands distributed at various maintenance levels: first line, second level, and third level. Newly-developed test equipment, such as the Orion 9000—presented at the conference—produced by GEC Avionics and distributed by Technitron System and other similar equipment in the R&D phase at Eurologs and other companies in this sector, will totally transform the concept of support for the electronic equipment of future aircraft.

The operational flexibility of the new systems—as Silvino D'Ercole, head of the avionic engineering department at Selenia's Defense Systems Division said during the conference—means among other things that this equipment can be used for all aircraft using the new standard and will achieve a twofold result. It will minimize the amount of test equipment for the EFA and create an integrated support program that will eliminate the need for any first line structure, since the IMRS/BIT (Integrated Monitoring Recording System/Built-In Test, the self-testing system for each item of equipment on the fighter) could be sufficient with minor modifications. Once in place, this program would also dispense with second level inspection, which would be replaced by an intermediate level between self-diagnosis and third level (the only level of maintenance and repair planned) for a rapid equipment check immediately after landing or before installation. The final result of this new support architecture will be a significant increase in the operational availability of the aircraft, all to the advantage of operations and efficiency.

Technitron's activity centers on marketing and distributing electronic and system components for military use in NATO countries. Technitron represents numerous firms that work in computer science for defense systems (400 employees in Europe with offices in Italy, Denmark, Ireland, France, the Netherlands, Norway, Sweden, the FRG, the UK, and the United States) and is involved in the transfer of advanced technology, principally by marketing and providing client support for: test stands, peripheral communication lines (it worked in CATRIN and test aircraft flight parameter telemetry systems. Technitron has also developed systems for real-time data transmission to earth for direct comparison with the results obtained in the simulation phase (AMX program), and a number of programs for advanced simulators for aerospace medicine, commissioned and currently in use by the AMI for the DASRS (Sea Practice Study, Research and Experimentation Area Division, SSD-GL6). Vincenzo Lanza, Technitron's sales manager, told the AIR PRESS correspondent that the company markets avionics integration components and test systems for use in the EFA. The company is also working on the definition of components for the ATE (Avionic Test Equipment) of the EFA and other military aircraft.

In addition to its work within the Eurologs consortium, Selenia is tendering in more than 20 calls for bids for the EFA's avionics components. In particular, Selenia has won contracts (as part of the four-nation consortium) for components for the operating system of the weapons system (cockpit interface unit) and for the computer symbol generator. The company is now awaiting decisions on bids for the mission/navigation-attack/defense computer and the computer for the interface between cockpit, pylons, and weapons. The Pomezia-based company's support work includes developing the ATE for the AMX and Tornado. The former is being carried out in cooperation with AMX International (for which Selenia had already worked on the development of the mission and communication system), Fiar, and Elettronica.

Italy's Magnaghi Milano To Develop Eurofighter Components

90MI0059 Rome AIR PRESS in Italian
3 Nov 89 p 2075

[Text] Eurofighter has assigned Magnaghi Milano the contracts for the development of the tanks and accumulators of the EFA [European Fighter Aircraft] hydraulic system following a call for tenders that involved Europe's leading manufacturers. The hydraulic tank is of the bootstrap type, and is equipped with an LVDT [linear variable- differential transformer] for the transmission of signals to the aircraft's computer. The accumulator, which features a separate nitrogen cylinder, is the result of long-term research conducted by Magnaghi Milano on applications for composite materials. Both the accumulator and the cylinder are in steel and carbon fibers to combine strength and lightness.

Magnaghi Milano is also taking part in the development of the primary flight servoactuators as a member of a consortium that also includes Liebherr Aero Technik, Dowty Boulton Paul, and Cesa. These actuaters use the most advanced fly-by-wire system to control the inboard/outboard flaperon and foreplane directions. The Italian company, and its UK partner, Dowty Boulton Paul, will also jointly develop the air intake cowl actuator, which will also use the fly-by-wire system to control the engine air intake configuration. The estimated value of these contracts for Magnaghi Milano alone exceeds 5

billion lire for the development phase and 55 billion lire for the completion of the program.

Italy: Electron Generation, Space Propulsion R&D Program

90MI0058 Rome SPAZIO INFORMAZIONI in Italian 1-8 Nov 89 pp 6- 7

[Text] During a recent visit by officials from the Italian Space Agency (ASI), the Florence-based PROEL Tecnologie—a Laben-controlled subsidiary and a member of the ISC (Space and Communications Industries Consortium)—presented its R&D programs which focus mainly on electron and plasma generation and acceleration technologies for space, scientific, and industrial applications.

In particular, the programs that have already been completed or are currently underway include the cooling experiment conducted at CERN [European Commission for Nuclear Research] in Geneva, which involves the development of high voltage acceleration and deceleration columns. Another is the Electron Generator Assembly program involving an electron gun for use on the first TSS-1 (Tethered Satellite System) mission developed jointly by Italy and the United States. This gun will enable current to flow in the conducting wire and regulate its flow. Finally, the Plasma Contactors/ Hollow Cathode program involves a special device designed to neutralize the positive electrical charge generated during the operation of ionic propulsors. PROEL Tecnologie is involved in various programs currently under study or scheduled to be carried out in the future. These include a variable-modulation electron generator and accelerator for long-wave electromagnetic pulse emission, which might be used for low frequency transmission via the TSS satellite. Other activities include monitoring the electrostatic charging of space vehicles and platforms to prevent electrostatic discharges, facilitate "rendezvous" maneuvers in orbit, and conduct tests requiring the satellite to operate at a high potential, and applying surface treatments using electronic radiation with real-time polymerization of the composite material matrix.

Italy Increases Participation in Arianespace Consortium

90MI0057 Rome SPAZIO INFORMAZIONI in Italian 1-8 Nov 89 pp 2-3

[Excerpt] [passage omitted] At a meeting held in Friedrichshafen (FRG) in September, Arianespace's board of directors decided to restructure the consortium's capital (which currently totals F270 million French francs [Fr], in view of the changes that had taken place over the previous nine years in the production responsibilities assigned to the various European companies. For example, Snia BPD (which is a member of the consortium through BPD Difesa e Spazio) had increased its share from 1.4 percent in Ariane-1 to six percent in Ariane-4, reaching an unprecedented 10 percent in the forthcoming Ariane-5 project.

The board of directors therefore decided to establish a holding company called Arianespace Participation. The initial capital will be provided by the founder members of Arianespace. Subsequently, new shareholders will be admitted and current shareholders will be entitled to increase their participation. As far as Italy is concerned, Snia BPD's share will increase from its current 1.4 percent to 4.6 percent (a 3.2 percent increase), while Fiat Aviazione will acquire 0.5 percent. These changes, however, will not affect the shares held by the other Italian companies, namely Aeritalia (1.1. percent), Selenia Spazio (0.8 percent), and ISC (Space and Communications Industries) (0.3 percent). As a result of these variations, Italy's total share will increase from 3.6 percent to a more sizeable 7.3 percent. Italy will now be in third place behind France (59.48 percent, including the projected one percent increase for SNPE and the FRG (19.6 percent), overtaking Belgium (4.4 percent). These changes are expected to be formally adopted at the next Arianespace shareholders' meeting, which is scheduled to take place in December 1989 or January 1990. On that occasion, the shareholders will also consider permanent representation for Snia BPD on the board of directors by one of its managers.

BIOTECHNOLOGY

FRG: Bayer Intensifies Genetic Engineering R&D

90MI0104 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 516, 30 Nov 89 pp 9-10

[Text] In the next few years, Bayer AG will expand its genetic engineering activities considerably and increase research investment from the current 150 million Deutsche marks [DM] per year to DM500 million. Chairman of the Board Hermann Strenger announced this at a two-day press conference in Wuppertal on "Genetic Engineering at Bayer." "The goal is to exploit the great opportunities offered by genetic engineering while at the same time ensuring that its applications are safe and nonpolluting," emphasized Bayer's chairman before an audience of more than 100 journalists from the FRG and abroad. Bayer is the first German company to present the priority points of its international genetic research to members of the press. Experts from various fields also commented on the history of this new science, reported on current projects and developments, and clarified safety aspects in the Bayer research institutes. In addition to in-house measures, financial support is provided for risk-related research outside the company and cooperation with independent institutes.

Strenger announced close cooperation, aimed at improving the company's own risk-related research, with three external, independent institutes: the Institute of Microbiology at Duesseldorf University, the Institute of Environmental Biotechnology at the Juelich Nuclear

Research Center, and the Institute of Soil Biology at the Federal Agricultural Research Institute in Braunschweig.

"We consider safety our highest priority," said Strenger. "For this reason we have decided, in addition to our own comprehensive analyses, to provide direct support for risk-related research outside our own company. We want to safeguard our research by carrying out joint experiments with external, independent institutes to establish whether the genetically modified microorganisms with which we work might constitute a danger for the environment." Bayer is providing an initial sum of DM4 million for this joint activity. The results of the tests will be assessed by a commission made up of representatives from the research institutes, the Central Commission on Biological Safety at the Federal Health Office, and Bayer AG.

Bayer's director, Prof. Karl-Heinz Buechel, who is responsible for research and development, presented the company's most important international research projects.

He listed the priority areas as the preparation of pharmaceuticals such as factor VIII for the treatment of hemophilia, the preparation of monoclonal antibodies for the prevention of potentially fatal shock conditions, and the development of therapies for AIDS and Alzheimer's disease. In the plant protection sector Buechel reported on basic research aimed at achieving more effective and nonpolluting preparations for crop protection.

Further information concerning the conference, especially the reports by Hermann Strenger, Prof. Karl-Heinz Buechel, Bayer AG board member and chairman of the committee on research and development, and Dr. Peter Stadler, head of biochemical process development in Bayer AG's pharmaceutical branch is contained in a comprehensive press folder obtainable from Bayer AG, Public Relations Department, 5090 Leverkusen Bayerwerk, Tel. 0214/301, Fax 0214/308923.

FRG: R&D Trends in Biotechnology

90MI0070 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 515, 15 Nov 89 pp 3-4

[Text] In recent years, the FRG has built up a first-rate, highly productive research capability in biotechnology, according to a statement made by FRG research minister Riesenhuber at "Biotechnica 1989." Nevertheless, the FRG is only at the beginning of a phase of industrial innovation in biotechnology developments that experts expect to last for the next 20 or 30 years.

The strengths of Europe and the FRG lie in the development of pharmaceuticals and vaccines, industrial enzymes, foodstuffs, plant breeding, especially seed production, and biological sewage treatment, closely followed by the development of diagnostic procedures, the production of antibiotics, biosensors, and the biological disintegration of dangerous substances (pesticides, oils, dioxine). There are still obvious shortcomings in bioelectronics, biological pest control methods, and pharmaceutical proteins. Some DM1.4 billion have been spent by the BMFT [FRG Ministry of Research and Technology] on funding biotechnology since 1982. Good basic research is now being carried out in all these areas, while efforts to solve the problems regarding young scientists are showing some success.

BMFT resources have been earmarked to continue funding the research work carried out by science and industry in this important field. A new funding program, "Biotechnology 2000," with a budget of about DM1.2 billion to be spent over a 4-year period commencing in 1990 is currently being drafted for this purpose. The program, which is due to be approved in the next few months, will further develop the existing biotechnology research infrastructure and address new fields, such as neural sciences (biocomputing), biosensors, and biological structure research.

The firm intention to make as great a contribution as possible to the drafting of longer-term framework conditions in this area is inherent in FRG research policy, as these are essential for industrial planning. The same safety standard levels have been successfully established for all the member states of the European Community, and these outlines must now be converted into national legislation. Contact with genetically modified organisms is scheduled for regulation by law during this legislature, thus creating a safe basis for controlling possible hazards and a reliable framework for further responsible R&D, and exploitation of the possibilities offered by genetic engineering in science and industry. This way, the high quality of the FRG environment in this field will be protected.

Finally, legal regulations also help improve acceptance of new technology. It is the responsibility of all involved, from both research and industry, to create an awareness of this. Providing public offices and authorities promptly with more information and giving the public more background knowledge should forestall misplaced fears about biotechnology. In this respect, "Biotechnica" plays a key role as an international workshop for the dissemination of the required knowledge among industry, the scientific community, the government, and the public. Hopefully this fair and the papers presented at the congress will not be restricted to the specialists, but will also attract interested members of the general public. It is precisely this type of event that can contribute towards establishing the consensus that will be required if this very promising branch of science and technology is to be further developed in a responsible manner.

The following table provides an overview of the subsidies for biotechnology granted to date and planned until 1993:

in DM millions							
1982	1983	1984	1985	1986	1987	1988	1989
98.9	113.6	116.9	141	172.8	216.8	260.6	263.1

The budget from 1990 through 1993 provides for the following expenditure:

in DM millions			
1990	1991	1992	1993
279.4	284	294.3	305.1

FRG: Research Groups Established

90MI0077 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 516, 30 Nov 89 p 7

[Text] The Board of the German Research Association has approved the formation of four new research teams, three of which will work in the field of molecular biology. Research teams are made up of several scientists working together on special research projects in the same place. These teams, which are usually set up for 6-year periods, contribute toward establishing new lines of research not yet adequately represented in the FRG.

In Marburg, a group of molecular biologists is working on "Transcription Control of Cell Differentiation." The nucleus of each cell in an organism contains the entire genetic makeup of its species, and yet one cell produces insulin in the pancreas while another neural cell "thinks" in the brain or causes a hair to grow on the skin. The specialty of a cell depends on which genes are read on the chromosomes in the cell nucleus. Specific genes, or effector genes as they are called, control this "transcription." The Marburg scientists have set themselves the task of identifying these genes and investigating how they function. Their investigations are carried out primarily on chicken and mouse embryos that have not yet adhered to the uterus wall, and whose cells are therefore not yet specialized in any way. They also plan to look into questions concerning their eventual diversification into pancreas and uterine mucous membrane cells.

In Erlangen too, a research team is working on the mechanisms that regulate the transcription of various genes in different organisms. "Adult" cells produce an extremely wide variety of proteins.

Their mapping's must be retrieved in the genetic makeup whenever the particular protein is needed. The research team on "Transcription Signals and Regulator Proteins" will investigate what triggers and inhibits transcription. Another research team in Erlangen is working on "DNA Viruses of the Hematopoietic System." It will examine the manifold interactions between retroviruses and herpes viruses, and cells of the hematopoietic system. Retroviruses have been identified as causing cancer in the hematopoietic systems of animals and human beings, though in the latter case not until the end of the seventies. The research team is investigating the little-known mechanisms involved in these processes.

The measurement of biomagnetic fields has been gaining increasing importance in medicine over the last few years. Extremely sensitive magnetic field sensors can be used to identify the sources of these fields much more accurately than by measuring the electrical potential distribution, as in EEG's [electroencephalograms] or EKG's [electrocardiograms]. The clinical research team on "Biomagnetism and Biosignal Analysis" in Muenster proposes to combine both localization processes to obtain a classification of functions according to anatomical structures, which has not been possible to date. The scientists hope that this process will open up a new therapeutic potential, particularly for epilepsy and tinnitus (noises in the ears). This measuring process, which involves neither blood tests nor exposure to radiation, makes it possible to delimit epileptic centers with precision—an entirely new opportunity in preoperative diagnostics.

With tinnitus, which is still widespread, affecting approximately 1 percent of the population, biomagnetic examinations represent the first opportunity to obtain objective proof of the disorder and to investigate its pathophysiology and symptoms.

While the clinical research team on biomagnetism will receive about DM8 million in special funding from the Federal Ministry of Research and Technology in the next 3 years, a large portion is being earmarked for a major item of innovative equipment. The other research teams have been allocated more than DM6 million for 2 years out of German Research Association funds.

DEFENSE INDUSTRIES

EUCLID Defense Program Discussed

90AN0147 Paris LE MARCHE DE L'INNOVATION in French 1 Dec 89 p 6

[Article: "EUCLID Takes Off"]

[Text] The EUCLID [European Collaboration for the Long Term in Defense] military research program (also

called "Military EUREKA") is getting off the ground: Its first concrete activities should begin during 1990. The goal is to set up "centers of excellence" at a European level specializing in key technologies. Their goal will be to avoid duplication of the very expensive military R&D projects in West European countries. The inital budget contains ECU 120 million for 1990, including ECU 40 million for France (taken from existing budgets). At present, 11 general R&D themes [Common European Priority Areas, CEPA], each to focus on one or two leading countries, have been selected: airborne radar technologies (FRG), silicon microelectronics (France), composite structures (Netherlands), modular avionics (FRG), electric cannons (UK), artificial intelligence (France), signature manipulation (Spain), optoelectronic devices (Italy), surveillance satellites (France/Netherlands), submarine acoustics (UK/Netherlands), and simulators (Netherlands). Research topics will be determined in February 1990 and a framework agreement among the various partners should be signed before summer. The first research contracts will be awarded by late 1990. Some major problems still have to be resolved, such as industrial property rights and ways to access the technologies developed.

In principle, the European manufacturers should be competitive. A committee of experts will select the topics on the basis of general strategic interest, after which project leaders will be designated. In reality, the manufacturers conducting the research will be designated according to the law of "intrinsic reciprocity." Thus, national companies will have priority in receiving the funds invested by their country. Maximum funding for selected projects will be 50 percent. In the long term, these sites will become component production centers for all the participating countries. According to Jean-Paul Chauvot de Beauchene, EUCLID coordinator for France, this project is justified at a time when defense budgets are being cut whereas arms development costs are undergoing an exponential increase. "It is better to perform on a world-class level in a few selected technologies than to underperform in everything," he asserted.

FACTORY AUTOMATION, ROBOTICS

Italy: Trento Institute's Robotics Project Described

90MI0051 Turin MEDIA DUEMILA in Italian Oct 89 pp 58-59

[Article by Giampiero Carlevaro: "The Robots of the Near Future will Communicate with Men"]

[Text] The IRST (Institute of Scientific and Technological Research of Trento), is currently one of the most important artificial intelligence research centers both in Europe and worldwide. Over 150 people work at the institute, which has an annual budget of approximately 20 billion lire. While IRST's activity is divided into research areas that cover the main topics in this sector, the overall strategy is "systematic" and interdisciplinary. This guarantees an integrated approach, which is a prerequisite for success, and generates prospects for innovative potential applications as well.

IRST's "robot project" conforms to this strategy and represents a test bench for the level of integration achieved between the institute's various research activities. The assumption is that intelligence should be considered a coordinated set of actions. For example, a robot that can perfectly distinguish objects in an image cannot be considered "intelligent" if it does not know what a wheel is used for. A robot demonstrates intelligent behavior if it can integrate its various fields of knowledge even though it may not excel in any one.

The goal of IRST's project is to develop a robot with an overall reasoning capability of achieving increasingly higher levels of intelligence. This robot system will be required to base its capacities on the integration of various complementary modules rather than on the development of one particular module (such as vision or dialogue). It must have the capability to perceive and communicate, process knowledge, and carry out actions. Obviously, to achieve these goals the system must also be very flexible both in movement and in recognizing the environmental situation, as well as in its interaction with the user, who is presumed not to be a single, specialized operator. This program, therefore, involves all the typical fields of research in artificial intelligence, from vision to cognitive modeling and natural language, and increases know-how in other related sectors such as engineering and mechanics. On the basis of these considerations, the approach adopted by IRST is to define a development strategy that involves producing the robot system in a series of stages. Each of these stages corresponds to significant behavioral aptitudes, and the increasing complexity of the performance required is consequently marked by an increase in the internal complexity in the subsystems involved. For example, the "simple" operation of transporting an object from one place to another means, among other things, the capability to locate both the object and its destination, grasp the object, plan a route, move along the chosen route, observe the environment to determine its structure and the presence of any obstacles, and the capability to react in unexpected situations, interacting, if necessary, with the human agent that instructed it (vocally, for example) to carry out the operation.

At an operational level, therefore, the development strategy used at IRST is based on singling out a set of actions that the robot must be able to perform at specified check points. The short-term goal is navigating the robot along the institute's corridors. Interaction with the environment is based on vision, low-level sensors, and an odometer. The visual subsystem is currently being integrated with the mechanical parts involved in movement. Modules have already been developed that derive relevant parameters of the robot's movement from images produced by television cameras. The capability to recognize and synthesize speech will also be integrated and play an important role in the system's overall performance.

The robot's level of "intelligence" must therefore increase gradually. In the medium to long term, the goal is to develop an authentic service robot capable of communicating with man, interpreting his orders, and overcoming any difficulties encountered while carrying them out.

CIM Technology Centers Described

90CW0143C Duesseldorf VDI NACHRICHTEN in German 5 Jan 90 p 12

[Article by CL: "Technology Transfer Supported by Federal Ministry for Research and Technology; CIM Landscape Completed; After Completion of the Northern Network, Computer Integrated Manufacturing Will Now Be Demonstrated Under Conditions Approximating Actual Use in 16 Locations"]

[Text] Secretary Riesenhuber satisfied his quota after the most recent of the CIM Technology Transfer Centers supported by the Federal Ministry for Research and Technology was opened in December at the Kiel Institute of Technology. Shortly before this, the fifteenth of these CIM TTCs was turned over in Bremen. These centers are supported with approx. 50 million German marks until 1992 under the auspices of the "Manufacturing Engineering" program. "CIM-TTZ," mused the president of the University of Bremen, Professor Jurgen Timm, on the occasion of the opening of the CIM Technology Transfer Center (CIM-TTZ) of the University of Bremen, "does that stand for 'CIM—Total Technology Quarrel' or for 'CIM- -Wonderful Technological Future?'"

One of the objectives of the recent founding serving as an interface between the university and the regional economy is to help the latter choice to be the solution of the abbreviation. To satisfy this claim and to provide support where it is needed for companies in the introduction and implementation of new technologies, the CIM-TTZ will provide information regarding the introduction of CIM as a solution strategy and will qualify and advise users. In October 1988, the Federal Ministry for Research and Technology approved an initial sum of 2.7 million German marks for the construction of this Transfer Center and thus an additional service of the university for the lower Weser area.

The University initially equipped the CIM laboratory in the Bremen Innovation and Technology Center (Bitz). From milling aluminum to turning steel, nibbling and reshaping aluminum, welding, cutting of thick sheet metal, up to and including robot assembly and stereolithography, all manufacturing methods applicable for the region of Bremen are already represented here in the work process with CAD, MRP and CAP links. Stereolithography intends to produce a three-dimensional actual- sized solid object without expensive intermediate steps. The CAD model of a product to be manufactured is used as the initial basis.

Manufacturing is based on suitable polymers that are cured selectively and predominantly in layers along calculated geometric contours by means of numerically controlled energy beams. In contrast to machining methods, this new production process has the advantage that it operates with a single tool—the energy beam—virtually without any forces in a purely liquid raw material. This eliminates the long-term, expensive production of tools and fixtures that must be available before the control information can be produced for the CNC machines from the CAD data. Following the just completed set-up period of the CIM Technology Transfer Center, the additional phases of development will connect the individual manufacturing processes to a data network and finally integrate material flow so that computer-aided planning and design, manufacture and assembly can be demonstrated in a single process.

For its activities, the CIM-TTZ of the University uses the infrastructure of the Bremen Institute for Operational Technology and Applied Work Sciences (Biba), an autonomous institute that is assigned to the University. Starting in 1991, the CIM-TTZ will work in one building with the Biba, as soon as this institute can move into its new building on the Hochschulring. For this reason, planning and design are now relatively far apart from the CIM Integration Center because these departments access the workstations and computer facilities of the CAD/CAM laboratory north of the Biba. All told, the Bremen-TTZ is one part of the large total program: the Federal Secretary for Research and Technology is providing support within the framework of a joint project over the entire Federal Republic for 16 CIM Technology Transfer Centers at universities from Kiel to Munich with a total of 62 million German marks until 1992 (including the technology follow-up estimate).

"CIM is a technology that allows factories to adapt to changing requirements," says Ministry advisor Helmut Bertuleit, the responsible section leader in the Federal Ministry for Research and Technology. However, you cannot buy CIM "off the rack", but rather you need solutions tailored to your factory. These solutions must consider the entire manufacturing process of a factory. This makes the orientation advice that the CIM centers are to provide all the more important. "Use the chance provided by the CIM-TTZ, and provide the support needed so that factory staff committees can also get information here!" Professor Bernd E. Hirsch, the leader of the Biba, directs his request in the same direction: "Today, you still have the chance of designing CIM yourself. The people who participate now do not need to have a foreign CIM concept forced down their throats later." Among the CIM technology transfer centers, the one of the University of Bremen is the second youngest. It was equipped for the specialized area of production technology, a technology that has just left the cradle itself: Only since 1984 have students been educated here to graduate engineers. The first graduates of production technology have just left for the industrial world with their diplomas in their pockets. Each of the 16 CIM

Technology Transfer Centers focusses on a different technical area. "CIM in single-series manufacturing and assembly" is the blanket theme of the Bremen CIM-TTZ. This theme is particularly important in the region of Bremen because the production of single-series is very important here in plant, ship and aircraft construction.

The College Group on Manufacturing Engineering (today: Scientific Society for Production Technology) provided the impetus. Starting from the potential in employees and equipment already available at the many colleges, CIM Technology Transfer agencies have been constructed at 16 locations, distributed over the entire Federal Republic, since the beginning of the program. The newest location is the CIM Technology Transfer Center at the Kiel Institute of Technology. Kiel is the only Institute of Technology in the series of locations. The Kiel Transfer Center provides the facilities to represent all factory operations from order confirmation with the customer to delivery of parts manufactured on CNC (Computer Numerical Control) production machines from start to finish. When designing the CIM components, it was important that, in addition to a comprehensive linking as a CIM total system, functional partial solutions or interfaces can be demonstrated.

"This applies in particular to the transfer of data from the CAD system all the way to the machine tools," says Professor Martin Storm, leader of the Institute for CAD/CAM Applications, the agency responsible for the Transfer Center. On account of historical development, the CAD area is particularly broad in Kiel. An additional focal point was created in the areas of computer-aided planning (CAP) and computer-aided manufacturing (CAM). This work area includes information integration on the shop floor. In training courses, particular importance was attached to the total exploitation of the rationalization potential of an operative level, designed to be transparent due to shop information systems, in conjunction with appropriate MRP instrumentation.

"The CIM Center in Kiel will also demonstrate start-to-finish initial solutions within the framework of its events," according to the speaker, Dr.-Ing. Joachim Heise. Above and beyond this, however, a particular focal point is the thematic conceptualization of conversion difficulties on the path to CIM. Because of this, the seminars mainly deal with individual CIM components and the appropriate interfaces to adjacent elements. In accordance with the project plan of the Federal Ministry for Research and Technology, the CIM-TT of Kiel is active in three areas: demonstration of the various CIM modules, provision of basic and special training, orientation information.

CIM Technology Transfer Centers and Their Areas of Emphasis

Shop-floor information systems in the CIM network (Kiel) MRP-centered interfacing of CIM modules (Hamburg) Databases for CIM (Berlin) Analysis and rearrangement of factories (Hanover) CAQ-centered interfacing of CIM modules (Brunswick) Assembly planning in CIM (Erlangen) CAD/CAM-centered interfacing of CIM modules (Munich) Personnel development and qualification; networks, communications technology (Stuttgart) Expert systems in CIM (Kaiserslautern) Interfaces (Karlsruhe) Procedures for CIM planning and introduction (Darmstadt) CIM strategy as a part of the company strategy (Saarbrucken) Simulation in CIM (Aachen) CIM manufacturing islands (Bochum) CIM definitions and CIM basic modules (Dortmund) CIM in single-series production and assembly (Bremen)

LASERS, SENSORS, OPTICS

CNET Makes First European Light-Emitting IOC

90AN0161 Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 22 Jan 90 p 3

[Text] The research arm of France Telecom claims to have made the first European light-emitting optoelectronic integrated circuit. Built at the Bagneux laboratories of the National Telecommunications Research Center (CNET), the device integrates a 30-mW output laser with an insulated gate field effect transistor. Laser threshold current is 10 mA, while the transistor, which is of the normally closed type, has a transconductance of 16 mS/mm. Laser power output as a function of control gate voltage is 3 mV/V with a bandwidth of 1GHz.

Intended applications for the circuit include optical fibre communications, but primarily the experimental unit opens the way for the development of more complex integrated optic circuits (IOC) which will significantly reduce the cost of fibre data distribution systems. The new IOC is based on Indium Gallium Arsenide Phosphide/Indium Phosphide material.

MICROELECTRONICS

Italy: SGS-Thomson Develops New Standard Cell Technology

90MI0060 Milan INDUSTRIA HI-TECH in Italian 30 Oct 89 p 23

[Text] SGS-Thomson Microelectronics of Agrate Brianza (Milan) has introduced the world's first family of standard cells using BiCMOS [bipolar complementary metal-oxide semiconductor] technology that can effectively integrate hybrid analog-digital functions. Their principal characteristics include advanced CMOS/bipolar technology with a maximum operating voltage of 10V, a complete series of analog and digital functions, and an advanced CAD support environment that also includes the first compiler for analog functions.

The cells are produced using the SGS-Thomson HF2CMOS process, a 2- micrometer technology with double metallization and double polysilicon, in which high performance bipolar and CMOS structures can be implemented. In the case of CMOS circuits, the process

has the typical characteristics of a high performance n-well process and allows for installation of insulated NMOS [N-type metal-oxide semiconductor] transistors. The bipolar components that can be obtained include six GHz npn [N-doped P-doped N-doped], 50 MHz lateral pnp [P-doped N-doped P-doped], and 1.2 GHz vertical pnp transistors.

The initial library contains 60 CMOS digital cells, each measuring 88 micrometers in height, and 80 analog cells. The analog cells, which can be produced in bipolar CMOS or BiCMOS technology, are 256 micrometers wide. All the cells have the powerdown function, which makes for a significant reduction in the circuit's total power consumption.

The digital library can be used to design complex circuits containing a maximum of 10,000 equivalent gates and based not only on flip-flops, counters, and registers but also on SRAM [static random- access memory], ROM [ready-only memory], and, in the near future, EEPROM [electrically-erasable programmable read-only memory] storage blocks. The high performance CAD instruments supplied by SGS-Thomson offer several advantages over other families of analog-digital standard cells. The user can derive a practically unlimited number of new cells from the basic function library by specifying a number of characteristics in parametric form.

Nixdorf Accepts Siemens Takeover Bid

90CW0143D Duesseldorf VDI NACHRICHTEN in German 19 Jan 90 p 22

[Article: "The Guessing Game About the Nixdorf Concern Is Over; Siemens Goes Shopping in Paderborn; Europe's Second Largest Information Technology Giant Created"]

[Text]The cat is finally out of the bag. After months of the rumor mill working overtime, the Bavarian electro-giant Siemens will become a partner in the sinking Nixdorf concern. Nixdorf boss Nasko does not expect the transaction to be accomplished before the summer. Good news has not been heard from Paderborn for a long time now. Even in 1988, the computer builder Nixdorf was able to improve its business results only with the aid of all types of balance- sheet cosmetics. Last year, only bad news followed. The erstwhile show horse in the stall of Federal German industry galloped into redder and redder loss areas. With every piece of alarming news from Westphalia, the number of companies in the circle of potential receivers of the tired concern increased. In addition to Siemens, the talk included Mannesmann, BMW, Olivetti, Alcatel, and even AT&T and Northern Telecom.

That Siemens won the race was no surprise: "The takeover action was not a surprise for us," says Jorg-Michael Plasker from the French competitor, Bull. For the solution is a German one, no stranger to the branch forced himself in. If the Cartel Office in Berlin agrees, Siemens will first take over 51 of the Nixdorf common stock and then incorporate its own company division Data and Information Systems into the Siemens- Nixdorf Information Systems AG, still to be founded. It "will at least be summer" until all the formalities have been taken care of, surmises Siemens spokesman Eberhard Posner. And even the Nixdorf chairman Horst Nasko expects that more details will be available at the stockholders general meeting planned for June. That is time for management, employees and competitors to adjust to the new situation. Primarily the Nixdorf employees are worried: "We fear the loss of jobs," the Nixdorf shop steward Franz Tolle reflects the concerns of his colleagues. For Nixdorf boss Nasko, it is precisely the excessive personnel planning that must be corrected. Siemens as partner of the Paderborn company is greeted with approval also by the employees. "A gentle financial rehabilitation is certainly simpler if a company with strong capital reserves is participating," explains Ulrich Starke who sits on the Nixdorf board of directors as the chairman of the company employee's council.

The joint enterprise would cover the entire range of computer systems—from the small PC, over mid-range computers, all the way to mainframes. A new computer giant, No. 2 in Europe after IBM, is being born. Taken together, the Data Processing divisions of Siemens and Nixdorf achieved sales of about 12 billion German marks last year. However, the competition appears unmoved. According to IBM spokesman Klaus Schonfeld, "Basically, the market will decide" about the business success, and "not the organization of the company." Competitor Bull is also unexcited. In the opinion of the publicity worker Plasker, the "combination of previously separate product lines will require considerable efforts on the part of both companies." In this respect, primarily the area of telecommunications appears unclear. Because of this, Ingrid Schubert, from the market research company IDC Deutschland in Kronberg, does not expect this area to be closed at Nixdorf. Possibly, supplementing product lines could be offered. ISDN a la Siemens-Nixdorf? Currently, calmness triumphs over uncertainty.

Critical voices are few and far between. It appears that the current Siemens activities are being evaluated differently, not only by the competitors but also by the public, than previous take-overs. The critical voices are few and far between. Even the Minister of Economics of North Rhine-Westphalia, Reimut Jochimsen (SPD), is celebrating the Bavarian giant of the branch as the savior in an emergency who is rescuing jobs in Westphalia. Whether they are celebrating too early in Dusseldorf, the capital of the Land, remains to be seen. Where the new enterprise will have its headquarters in the final analysis has not yet been determined.

And not the last matter of concern, two enterprises with very different cultures must be melded. The "serious Siemens man with a Nixdorf temperament," as one woman from Paderborn described the future employee type with gallows humor, must first be created. For, according to Horst Nasko, "Precisely the area of data

processing requires flexibility. We need foil fencers, not heavyweight boxers." That will require a lot of energy and time from the bosses. A time of consolidation that the large competitors in the market will certainly know how to use.

New ESPRIT II Projects Discussed

90AN0130 Paris ELECTRONIQUE HEBDO in French 14 Dec 89 p 16

[Article by Francoise Grosvalet: "Green Light for Development of European 0.5-μ ASIC CMOS Technology"]

[Text] Following the second European Strategic Program for Research and Development in Information Technologies (ESPRIT II) request for proposals, the EC Commission in Brussels has selected 23 projects for the establishment of a European technological sector covering application-specific integrated circuits (ASIC), gallium arsenide, and mass storage devices.

These projects, which cover advanced microelectronics and peripherals technologies, join the 156 projects already launched under the ESPRIT II framework. They cover the main topics selected as major research areas in the 1989 work plan adopted last May. Specifically, they focus on submicron complementary metal oxide semiconductor (CMOS) technology for ASIC's and III-V semiconductors for high-speed applications. The 23 contracts, which represent 43 percent of the 1989 proposals, should be signed by the end of 1989. A second group should be announced in early January. The current projects involve a total funding of ECU 212 million, half of which is to be provided by the EC.

The projects conform to the precompetitive spirit of the European program; however, the ones dealing with the manufacture of semiconductors could at a later stage be integrated into the Joint European Submicron Silicon Initiative (JESSI). Small and medium-sized companies and industries are represented in 20 percent of the projects.

Submicron CMOS-SOI Technology

In the field of microelectronics, the work plan adopted last May focused research on the development of a 0.5-μ CMOS ASIC, with a silicon-on-insulator (SOI) version, and on III-V compound semiconductors. The Commission thus selected the proposals for development of 0.5-μ ASIC CMOS technology submitted by ES2 [European Silicon Structures], SEL [Standard Elektronik Lorenz], British Telecom, CNET [National Center for Telecommunications Studies], Telefonica, IMEC [Interuniversity Microelectronics Center], Matra Harris Semiconductors, Telefunken, MIETEC [Microelectronics Technologies], Plessey, and STC Components. The aim of the project is to develop CMOS technology optimized for the creation of highly complex ASIC's integrating various operational modules (microprocessor cores, random-access memories, read-only memories, etc.). It will also be necessary to ensure that there exist customized computer-assisted design (CAD) aids for the project, especially those developed as part of ESPRIT I.

The four-year project should culminate in the development of 0.5-μ CMOS composite matrices, with, as an intermediate objective for the end of the second year, the development of 0.7-μ ASIC integrating more than 800,000 gates.

GaAs for Real-Time Signal Processing

The second project selected, in accordance with the objectives set last May, covers the development of high-performance, submicron CMOS-SOI technologies. It was submitted by Thomson Composants Militaires er Spatiaux, LPCS, Sextant Avionique, SGS-Thomson, Telefunken, CEA-LETI [Atomic Energy Commission—Laboratory for Electronics and Information Technologies], the Fraunhofer Institute, MEDL [Marconi Electronic Devices Ltd.], NMRC, and the University of Sheffield. The aim is to demonstrate the industrial usefulness of silicon-on-insulator technology and its technical advantages relative to conventional CMOS technology at an equivalent level of complexity. This, too, is a four-year program, the goal of which is the manufacture of highly complex 5-μ CMOS-SOI circuits (these circuits could be the same as those selected for the 0.5-μ CMOS ASIC project).

Another project, also in the microelectronics field, concerns the development of signal processors using innovative III-V semiconductor technology. It was sumitted by Siemens, the Fraunhofer Institute; Argumens GmbH; Plessey; Telefonica; and various Italian, Spanish, and British universities. The project adheres to the work plan for fast GaAs integrated circuits. Another proposal, submitted by the University of Glasgow, Alcatel Espace, Farran Technology, GaAs Code, NMRC, and the University of Cambridge, dealing with monolithic integration above 26.5 GHz, can be coupled with that project. The overall aim of these projects is to develop a GaAs technology that makes it possible to integrate on a single chip analog and digital functions for real-time signal processing applications. In an initial two-year stage, the contractors will have to select the most appropriate self-aligned gate field-effect transistor (SAGFET, a variant of current FET technology), HFET (all types of composite interface FET technology, such as high-electron-mobility transistors), or HBT (heterojunction bipolar transistor) technology. In a second two-year stage, these projects will have to result in the development of circuits using this technology in the form of basic small or medium-scale integration modules.

Objective for 1994: 160 Megabytes on 2.5-Inch Disk

Other projects can be coupled with the three previous ones since they are complementary. This is the case for: the project submitted by MIETEC, SGS-Thomson, SEL, NMRC, and Elekcent for encapsulating CMOS ASIC's in a plastic package; the project on rapid development of prototypes (INESC, Companhia Portuguese Radio Marconi, SACRPM, and Milano Ricerche); and the project on

IC development for mobile chip card readers (Telefonica, Amper, Bull CP8, RTC-Compelec, and Sinorg) and on advanced millimetric subassemblies (Thomson Composants Microondes, Thomson CSF, Alcatel Espace, Elekcent, Telefunken, Daimler-Benz, and the University of Lille).

Of the 23 projects selected at the end of November, four concern peripherals and 11 others deal with manufacturing and testing (some of which, moreover, fall within the scope of JESSI).

As regards peripherals, Rodime Europe, Eurodisk, Laboratory for Coordination Chemistry (LCC), Europe des Composants, Applied Magnetics Belgium, and Pilkington have joined together to develop a European magnetic disk technology. The aim as set forth in the work plan in this field is to develop, under a four-year program, 2.5-inch 160-megabyte (formatted) and 3.5-inch 1-Gigabyte (formatted) disk drives using thin-film magnetic technology.

The other projects selected in the field of peripherals cover the following: printers (Bull, OCE, and Siemens), servers (Bull, Philips, and Siemens) and a new printing technology (SEL, OCE, Monotype, and RWTH [Rhineland-Westphalia Technical University of Aachen]).

In the field of manufacturing, the ESPRIT II work plan for 1989 emphasized development of multichamber, multiprocessing systems and of computerized lithopgraphy stations; high-speed generation of graticules; and automatic wafer measurement. The overall objective is to develop a range of automated, mutually compatible equipment that meets tomorrow's requirements (automation, pollution control, 200-mm wafers, submicron design rules). All sectors are covered by the proposals selected. Thus, for example, in the field of lithography, under the European Lithography Innovation (ELISA) project, Philips, SGS-Thomson, Valvo, and British, Dutch, and Greek universities wil be working to develop a European device for high-speed development of graticules. Carl Zeiss, ASM-Lithography, and Heraeus are proposing a feasibility study on the optics required for tomorrow's deep UV wafer steppers. In a different field, Alcatel, AST Elektronik, Balzers, CEA-LETI, Philips, Siemens, SGS-Thomson, and others will be working to develop a multichamber production system. This three-year project should result in the production of a fully automated prototype, with cassette-by-cassette loading, capable of performing several operations without removing the wafer—200-mm, of course—from the chamber.

JESSI Program Entering Active Phase

First Projects Approved

90AN0128 Paris ELECTRONIQUE HEBDO in French 7 Dec 89 p 18

[Article: "JESSI Enters Active Phase"]

[Text] The Joint European Submicron Silicon Initiative (JESSI), the European research program on integrated circuits, is entering an active phase. Two projects have now been initiated: one on memories, the other on the standardization of electronic computer-assisted design (CAD) in Europe.

Although about six months behind schedule, JESSI is doing nicely—perhaps precisely because of the time lost; today, the key players feel comfortable in their roles, and feelings of doubt regarding the role of small manufacturers of semiconductors are almost behind us.

Some initial decisions have been made: Two projects are off the ground; several projects have been revised to reinforce the concept of cooperation; and the major manufacturers have agreed to discuss the rules of the game with the six "small" European chip makers.

The JESSI board of directors met for the first time last June. The organization plan was approved in September. On 8 November, there was an initial screening of individual projects among those proposed. Initially, there were numerous candidates—five in the "technology" subprogram, 15 in "basic research," 71 in "equipment and materials," and 36 in the "applications" subprogram (development of CAD tools for design of advanced integrated circuits and their integration into systems; and Europrojects, i.e., design of prototypes to test advanced systems concepts using technology that will be available in three years).

Fourteen Partners To Develop Standards

Subprogram managers finally endorsed about 30 projects; of these, 18 were submitted at the 8 November JESSI board meeting: the five "technology" projects, 11 "applications" projects, and two basic research projects. A descriptive "blue paper" was prepared for each project.

On 8 November, the decision was made to go ahead with two projects: one on memories, under the "technology" subprogram (the best prepared because it dates back to the beginning of JESSI), the other on CAD "integration". The latter project calls for development of a core CAD tool to enable client-users of circuits from the three major European chip manufacturers to have standardized design aids. Cooperation in this field had already been initiated a year earlier by the "Big Three" as part of the SIGMA random-mask gamma imaging system project.

As of now, 14 partners (including Bull, Alcatel, and ICL) are collaborating in the development of standards. New partners are expected.

The other projects were not approved as submitted because the board felt that the cooperative aspect was inadequate. Moreover, the program will have to be tightened up, because if all the projects had been approved, there would have been no funds left for new initiatives in 1991 and 1992.

The list of new projects selected will be available at the end of January when the next board meeting is held. In the meantime, subprogram managers will review their selections and may approve new topics to be examined to determine whether the concepts of the CAD and technology researchers match the principal goals of industry and whether the "technology" and "applications" subprograms start out with the same data bases.

Under the "technology" subprogram, the project on memories has been implemented, but the subprogram's four other projects have not (two application-specific integrated circuits [ASIC] 0.8-μ projects and two projects on the scientific theory of semiconductor manufacture); those projects have been deemed too individualistic, so they will have to be reworked.

Funding: Doubts Concerning EC's Role

As concerns funding, while the percentage of the contribution of the respective governments is now clear (or almost), the EC's potential contribution is not. The funding should come out of the EC Framework Program for research. But that program is being revised and the outcome of that process will determine the funds allocated to microelectronics. So, for now, we are left in suspense. In the meantime, France is supporting the French portion of JESSI. If the EC gets into the act, industry's current proposals could become more ambitious.

Moreover, it is impossible to avoid raising the problem of conflict with the European Strategic Program for Research and Development in Information Technologies (ESPRIT). The ESPRIT 1989 request for proposals was divided into two parts: One covered JESSI, the other was open to anyone (among them, 0.5-μ ASIC projects). In the first category, JESSI has adjudication authority; in the second, ESPRIT officials decide.

The major European semiconductor firms did not reply to the second request for proposals, partly because they felt it was too early to examine 0.5-μ ASIC projects, and also to register their displeasure at the treatment accorded JESSI. The situation is complicated, moreover, by the fact that the European semiconductor "minors" (STC, Plessey, ES2, AEG, MHS, and Mietec) are now part of JESSI. In October the "Big Three" were still reluctant to admit that agreement could be reached among nine participants; for example, the discussions on funding contributions were already complicated enough with three.

The contending parties buried the hatchet on 8 November and collaboration has begun. Nevertheless, the smaller companies responded to the ESPRIT ASIC request for proposals and the EC agreed to fund them. Will the ESPRIT ASIC project become a sixth JESSI "technology" project?

In addition, the Daimler group (AEG-MHS) no longer wants to be considered a minor player. Daimler has already brought pressure to bear on the FRG Government for recognition of the firm as one of the major European semiconductor firms. And, as we know, the West German Government will support Daimler. It is no secret that industrial policy in Germany is almost totally dictated by industry! More important, new positive contacts have taken place over the past few weeks between MHS and the "Big Three" with a view to having Matra MHS receive more recognition from the majors. So we will soon be speaking of the "Big Four" and no longer of the "Big Three."

Program Encountering Delays

90AN0143 Rijswijk PT/AKTUEEL in Dutch 20 Dec 89 p 1

[Article: "JESSI for MKB"]

[Text] A new international center will be established to involve small and medium-sized companies in the Joint European Submicron Silicon Initiative (JESSI). JESSI, the EUREKA project for the development of integrated circuits of 0.7 micron and smaller, currently involves a number of major companies and universities. It seems difficult to arouse the interest of Dutch small and medium-sized companies in JESSI. According to an inquiry, not a single software house is participating in JESSI or has even expressed interest. The Dutch Ministry of Economic Affairs will provide government subsidies to JESSI on the condition that in addition to Philips, smaller companies also be included in the EUREKA project.

In the meantime, Philips has announced it will allocate 1.2 billion guilders to JESSI for the period up to 1996. The company has as yet no idea when the Ministry of Economic Affairs will finally come through. Most likely, it will not come up with any concrete commitments until spring 1990. Thus, JESSI is once again suffering delays.

European DRAM Producers React to Japanese Deal

90AN0165 Brussels EUROPE in English 31 Jan 90 p 12

[Report: "European DRAM Manufacturers Welcome Price Undertakings Offered by Japanese Producers and Consider That They Will Also Have Positive Effects for User Industries"]

[Text] Following the publication in the OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES of the EC Commission regulation which accepts the price undertakings offered by Japanese exporters of "Dynamic Random Access Memories" (DRAMs), European manufacturers reacted positively. The European Electronic Component Manufacturers Association (EECA) welcomes this decision, which results in fact from a complaint lodged in 1987. EECA would have preferred a faster decision, but "it appreciates the Commission's effort to go through the painstaking process of discussing

the implications of any measures with member-state governments, the users of DRAMs, and DRAM manufacturers."

The decisions taken, according to EECA, are "the adequate measure to terminate this anti-dumping procedure and will protect the EC DRAM industry against a recurrence of dumping by Japanese exporters." The minimum prices set will allow users to benefit from gradually decreasing prices due to normal reductions in production costs and, at the same time, European manufacturers will benefit from an effective safety net which will protect them against dumping. Furthermore, the users will benefit from a larger number of competing manufacturers, as European manufacturers will now be willing to continue investing heavily in production facilities for future generations of DRAMs. As reference prices will be based on the average cost of production of the cheapest device type, Japanese manufacturers with higher production costs will be able to sell at prices below their costs.

EECA considers that the Commission's decision is an unequivocal signal to all manufacturers exporting DRAMs into the EC that it will not tolerate predatory pricing in an industry which is considered of paramount strategic importance to the future industrial development of the European Community.

EECA's statement is accompanied by a technical analysis of the Community decision which reveals that:

a) The residual anti-dumping duty which was adopted at the same time by the Commission can now only apply to previously unknown producers who have not yet offered an undertaking. Therefore, the duties have no direct effect at present and will have no influence on market prices in the EEC.

b) All DRAM products, irrespective of density, packaging, speed or other characteristics, are covered by the undertaking. In practice, the undertakings concern mainly DRAMs with a storage capacity of 256K and above.

c) New DRAM generations are subject to the undertaking, but under a special formula which should encourage the user industries to employ most recent technologies as early as possible, so as to remain competitive. Users may obtain new-generation products at a lower price for a certain period of time following their first introduction to the market.

d) Reference prices will be significantly below the market prices: Concerns that the undertaking will lead to price increases seem unfounded. EECA is rather concerned that the transparency of the prices which results from the undertaking may now lead to price reductions. Production costs for DRAMs continuously decrease during the period of mass production: Towards the end of a life cycle, when quantities become relatively small, cost of production and thus prices tend to increase slightly. As the reference price follows cost of production, reference prices will also only increase moderately.

e) The weighted average reference price was chosen in order not to hinder competition: If individual company specific prices had been established, later entrants to the DRAM market would have effectively been banned from the market. The concern about cartelization is, according to EECA, without merit: The reference price is only a safety net, applicable to the lowest cost device type in each density. All othe more expensive products will normally be sold at significantly higher prices which will vary from company. Market forces will thus be left untouched. Finally, the undertaking safeguards effective competition from other, non-Japanese suppliers: Competition on the DRAM market will therefore rather increase than decrease.

f) The undertakings will not prevent dumping by all producers, but will enable to avoid its worst consequences.

g) The undertaking has been very carefully drafted so as to avoid, to the greatest extent possible, negative consequences for the user industries. EECA is convinced that the undertaking, in the long term, will produce very positive effects not only for the EC semiconductor industry, but also for the EC DRAM user industries.

French Firm Develops Chip Connection Method

90AN0131 Paris ELECTRONIQUE HEBDO in French 14 Dec 89 p 26

[Article by Frederic Fassot: "Silicon Multichip Interconnection Using Microbeads"]

[Excerpts] The Electronics and Information Technology Laboratory (LETI) has just developed silicon multichip interconnection technology in which chips are connected by microbead leads in the substrate—a much more efficient solution than wafer-scale integration.

To eliminate the interconnection restraints of wafer-scale integration technology, an interconnection substrate must have conductors and dielectrics of at least 5 µm. LETI has just developed a silicon "multichip" technology whereby chips are connected in the interconnection substrate by microbeads (flip-chip technology). This was the subject of a presentation by Mr Nicolas, head of the micro-connections group at LETI, during a meeting of the International Society for Hybrid Microelectronics in Versailles on 6 December. This technology allows the achievement of an RC time constant 100 times more efficient than that attained using wafer-scale integration, thus making possible the creation of conductive paths several centimeters in length and 10-cm modules. The process is as follows: Power-supply and ground lines can be cut from one silicon wafer, integrating decoupling capacitors onto the wafer through microelectronic processes (oxidation, metallization, etc.).

Copper/Polyimide Substrate With 2.5-m Paths

The preparation of the wafer thus makes possible decoupling values of 100 nF/cm^2. Next, a thin, multilayered interconnection substrate of copper/polyimide is produced: The conducting layers are obtained through an additive process with electrolytic reinforcement of the conductors. The conductors and the dielectric layers are approximately 5 μm thick. The conductive paths are typically 25 μm wide; in future, this could fall to 12.5 μm. Bump contacts or micro-solder pads are deposited on the chips' terminations through microelectronic methods (deposition through evaporation or electrolytic reinforcement). LETI uses indium or tin/lead alloys. The space between the microbeads is about 50 μm, and their diameter is typically 100 μm. The chip is mounted on the substrate by means of a Flip-Chip bonding tool marketed by Microcontrole. It is thus possible to directly link certain microbeads to the power-supply ground lines of the wafer, whereas others are connected to the copper/polyimide substrate for signal transmission.

Nevertheless, this technology still has its limitations. Thermal dissipation from the chip to the substrate occurs through microbead leads positioned on the chip for this very purpose (they do not serve as electric connectors), thus limiting, by both their size and quantity, the power that can be dissipated. In this sense, this technology is aimed more toward logical circuits and complementary metal oxide semiconductor (CMOS) technology than toward power circuits. However, thermal dissipation can reach 5 W for a 1-cm^2 chip. Moreover, more powerful applications may be possible by placing a cooling device (heatsink, etc.) on the back of the chip.

Convincing Manufacturers

The success of interconnection technology is largely dependent on manufacturers' cooperation. The process requires chips in wafer form. But semiconductor manufacturers balk at the prospect of making chips in this way—the method allows the client to easily evaluate the manufacturer's efficiency. This obstacle could be avoided by ordering the wafers on the basis of a fixed percentage of functional chips: The confidentiality of the manufacturer's efficiency rating would thus be preserved. Moreover, only IBM, which uses flip-chip technology for internal needs, designs circuits with terminations located across the entire surface of the chip. Semiconductor manufacturers, operating under market forces, position the terminations on the edge of the chip, a layout that limits the potential of this interconnection technology. The ideal solution would be for manufacturers to follow IBM's lead and opt for a more surface-oriented design in their integrated circuits. LETI originally developed the interconnection multichip for military applications (infrared vision devices). The institute is nevertheless willing to sell the license to any industrial concern. Furthermore, the recent creation of an economic interest group including, among others, LETI and the National Center for Telecommunications Studies (CNET) in Grenoble, could in future result in the use of this microconnection technique in telecommunications materials (telephone exchanges) or in high-definition TV applications.

NUCLEAR ENGINEERING

X-Ray Facilities for Synchrotron Set for 1994

90MI0094 Milan ITALIA OGGI in Italian
7 Dec 89 p 37

[Article by Daniele Bo: "Ansaldo Wins Bid for Grenoble Synchrotron"]

[Text] Ansaldo, together with the French Bouygues and German Strabag groups, will design and construct a large part of the structure and buildings (about 80 percent) of the European Synchrotron Light Laboratory (ESRF) in Grenoble.

The order was made following a call for bids which involved twelve multinational consortia. The value of the order is approximately 80 billion lire, about half of which should go to the Italian group which will work on the strictly technological aspects. In terms of value, this will constitute approximately 20 percent of the investment costs for the entire project. The goal of the ESRF, which is financed by eleven European countries, is the development of a 6GeV electron accelerator ring to be used as a source of synchrotron light in the area of X-rays, starting from 1994.

The facility will be used by scientists from countries involved in basic and applied research in sectors such as the science of materials and surfaces, crystallography, physics, earth sciences, biology, and medicine.

In January, construction will begin on the buildings that will house the accelerator, the electron accumulation ring, the circular experimental "hall" with a circumference of almost one kilometer, and some auxiliary technical equipment. Work should be completed in the fall of 1991.

In the meantime, work is proceeding on the components of the accelerators. Forty percent has already been contracted out to various European firms.

It is expected that the first synchrotron radiation will be produced by the end of 1992.

FRG: Nuclear Research Projects at Juelich Reorganized

90MI0102 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German
No 516, 30 Nov 89 pp 8-9

[Text] The research program at the Juelich Nuclear Research Facility (KFA) has been brought into line with new requirements at various stages over the last few years. This first gave rise to three key research programs: materials research on high temperature materials, basic

research on computer science, and environmental research. The fourth key research program, on power engineering, has also been restructured over the last 2 years.

In the last 3 decades, most of the KFA's nuclear technology research work has been concerned with the development of the high temperature reactor as a power generator and a heat generating process for temperatures of up to 950° C. Major successes in its industry-oriented work have been the operation of the AVR [atomic pilot reactor] and the entry into service of the THTR [thorium high temperature reactor] 300 prototype reactor. The "Nuclear Thermal Process" (PNP) and "Long-Distance Nuclear Energy [Nukleare Fernenergie]" (NFE) projects have also made a detailed study of the conversion of fossil energy sources, especially coal, into nonpolluting secondary energy sources such as synthesis gas, hydrogen, and methanol.

Following the merger of the Institute of Reactor Development (Theory Department) with the Institute of Nuclear Safety Research, future work on reactor technology and safety will continue at a new Institute of Safety Research and Reactor Technology (ISR) under two directors. The new institute will engage in R&D work on the safety of nuclear and nonnuclear technical systems. In particular, it will also make safety assessments for nuclear power stations and draw up the relevant methods and data in keeping with expected future requirements.

The experimental department of the Institute of Reactor Development has already redirected its research program toward materials technology over the last 2 years. The new work focuses on the development of technical protective coatings and advanced material production methods. In line with its new profile, the institute's name will be changed to "Institute of Applied Materials Research" (IAW) effective 1990.

The KFA's long-term research on fusion is an integral part of the EC's fusion program, and a collaboration agreement concluded with EURATOM guarantees it a place in the KFA's future research program as well.

Among the various alternative sources of renewable energy, photovoltaics, or the direct conversion of sunlight into electrical energy, has great application potential. This potential can be developed on a commercial scale provided the production process costs can be cut and the performance level of the solar cells can be raised. A photovoltaics team has been established at the Institute of Coating and Ion Technology to develop various coating production and characterization processes that are of great importance for photovoltaics.

Early next year, the Institute of Reactor Components (IRB) will be replaced by a new Institute of Power Engineering (IEV) that will focus on several system elements in the power sector. Fuel cell technology and research on hydrogen technology already underway at the KFA will have priority in the new institute's work. Research on catalytic combustion will complement this long-term research project. It is also planned to establish a team to work on matters involving efficient power generation and consumption.

At the beginning of 1990, a team working on processes for improving power use and minimizing pollution in combustion plants will be transferred from the former Institute of Reactor Development to the Institute of Technology. The team's promising industry-oriented developments should lead to industrial applications under the technology transfer program.

Systems analysis studies are of great importance in clarifying interrelations and classifying the effects that the various alternative sources of energy have on the environment. The KFA's team on systems research and technological development possesses a great deal of expert knowledge on drawing up and presenting strategies and their marginal conditions for the energy sector. This team's systems analysis studies will continue to support the KFA's work on power technology in the future as well.

SCIENCE & TECHNOLOGY POLICY

European Biotech Firms Call for 'Coherent' Policy

90AN0166 Brussels EUROPE in English 1 Feb 90 p 15

[Text] Brussels, 31 January (EU)—For lack of a coherent Community policy in the area of biotechnology, the competitiveness of European industry will be compromised: This is the warning call issued by seven large European companies regrouped within the SAGB (Senior Advisory Group on Biotechnology), affiliated with the European Chemical Industry Federation (CEFIC). They explain that Europe is falling behind the United States and Japan in the establishment of effective biotechnology policy and, therefore, in the development of biotechnology itself. Already the gap is increasing and European talent and investment are emigrating to more favourable political environments. The SAGB delivered its message to the European Commission in a paper entitled "Community Policy for Biotechnology: Priorities and Actions."

As a first step, the SAGB calls for the coordination of the Commission's many biotechnology policy initiatives and proposals. Key areas to be addressed include the establishment of a clear product registration system based on safety efficacy and quality criteria, the promotion of research and development, patent protection, and the establishment of a single Community market for biotechnology processes and products.

For Dr. Peter Boyle, the chairman of SAGB, 1990 will be a pivotal year. According to Dr. Boyle, "It is essential for individual European nations and for the Community to recognize industry's stake in biotechnology and the exciting potential it offers. It is an important set of new tools which many different sectors of industry will use to

produce pharmaceuticals, agricultural products, foods and many other goods for personal and industrial use. Those with the best technology will be the most competitive." He also underlined that biotechnology is opening unique opportunities for progress towards many of the Community's primary political goals, including the health and safety of its citizens, environmental quality, agricultural vitality, regional development and aid to developing nations.

European Institute of Technology Projects Noted

90AN0146 Paris LE MARCHE DE L'INNOVATION in French 1 Dec 89 p 5

[Text] The European Institute of Technology (EIT) has just issued its first grants to 14 R&D projects selected from a total of 800 proposals. Each project will receive between $200,000 and $800,000 (over a three-year period) to complete its program. Included among the grantees are programs for: the improvement of adhesion between strengthening agent and matrix in carbon-fiber composites (University of Potenza, Italy); the enhancement of ultrasonic imaging (University of Saarbruecken); and the optimization of conditions for surface treatment by laser (Fraunhofer Institute, Aachen). The National Mining College of Paris will be studying technical processes for the manufacture of ceramic parts by injection, a study that is also being financed by the Ministry for Research and Technology. The EIT was founded by major private companies (about 20 by late 1989) to create European R&D "centers of excellence." In all, subsidies for its first year amount to $7 million. This operation will continue in 1990 and should cover grants totaling ECU 5 million.

FRG: Max Planck R&D Plans, Budget Reported

90MI0113 Munich MAX PLANCK JAHRBUCH 1989 in German 1989 pp 74-82

[Excerpts]

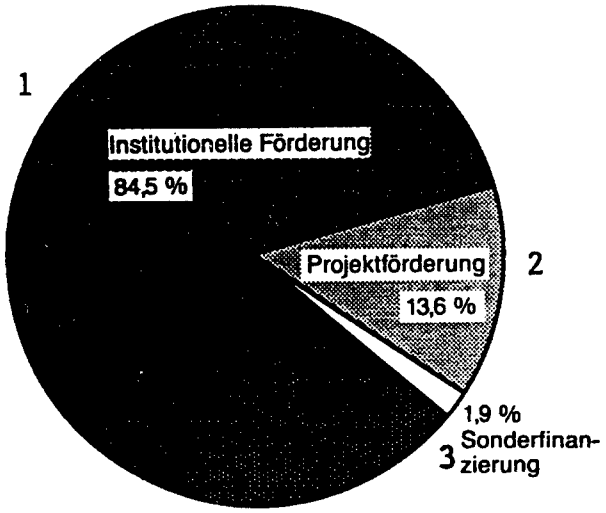
Personnel and Finances *Personnel*

In 1988 the Max Planck Society and the facilities that it administers comprised 8,595 posts including 2,258 (26.3 percent) for scientific personnel. In addition, there were 3,734 guest scientists and scholarship holders, including 1,363 doctoral candidates. As of 1 February 1988, the effective date of the statistical survey, the society also employed 668 staff members—including 357 scientists— whose positions were financed out of funds from project subsidies, and 485 trainees and assistants.

Compared with the preceding year the turnover in science posts decreased slightly, as 11.8 percent of the scientists in established posts left the society (1987: 13.1 percent) and 10.4 percent were newly recruited (1987: 11.1 percent).

In keeping with the longer average period of employment than in previous years, the average age of the scientists at the institutes rose as well, albeit only slightly. The average age of the scientific members rose to 55.5 years, that of middle-ranking scientific staff to 49.4 years, and that of the other scientific staff to 42.5 years. The number of scholarship holders and guest scientists increased slightly from 3,727 in 1987 to 3,734 in 1988. A total of 2,156 FRG scholarship holders—as against 2,139 in 1987—and 1,578 scholarship holders and guest scientists from abroad (1987: 1,588) were working at the institutes. The number of guest scientists from the East European countries rose from 371 in 1987 to 384, approximately 24 percent of the foreign guests.

Total Income 1988



Key: 1. Institutional Funding = 84.5 percent—2. Project Funding = 13.6 percent—3. Special Funding = 1.9 percent

For the Max Planck Society the 1988 fiscal year closes with income and expenditure of about 1.279 billion Deutsche marks [DM] (see table). Income was divided as follows among the various sources:

In addition to general income, amounts taken from the reserve, and the balance carried over from the preceding year, the Max Planck Society received subsidies amounting to DM1.046 billion under the heading of institutional funding. These grants increased by 3.84 percent over the preceding year. The general budget (Budget A), to which the Federal and Land governments each contribute a 50 percent quota, was funded with a 4.56 percent increase in basic financing over the preceding year. In addition, the Federal and Land governments granted approximately DM24 million in special funding. The subsidies for the Max Planck Institute of Plasma Physics (Budget B), which is financed by the

Federal Government and the Free State of Bavaria in a ratio of 90:10 and which also received additional grants from EURATOM [European Atomic Energy Community], increased by DM2.3 million over 1987. This amount included DM1.3 million in public subsidies and DM1.0 million in EURATOM grants to finance investments on extensions under the European fusion program.

In addition to institutional funding grants, in 1988 the Max Planck Society once again received considerable resources in the form of project funding to finance specific scientific projects. These grants (excluding balances carried over from the preceding year) increased by DM11.7 million (8.23 percent) compared with the previous year, to approximately DM153.8 million. Of these, Federal Government grants amounted to DM85.2 million and those provided by Laender to DM27.6 million. DM41 million were provided from other public and nonpublic subsidies, including grants from the German Research Association and the European Community, and private sector donations. In 1988 nonpublic grants totaled DM19.8 million. They included DM1.8 million in grants from the Volkswagen Foundation and DM3.4 million from the Association of Foundations for Promoting German Science, which also contained DM2.2 million in Hermann and Lilly Schilling Foundation funds to support the clinical research group on multiple sclerosis in Wuerzburg. The German Cancer Relief Organization also provided a total of DM1.5 million. Other special purpose subsidies amounting to about DM13.1 million were granted by the Thyssen Foundation (DM0.45 million), the Krupp Foundation (DM2.5 million), and various commercial companies.

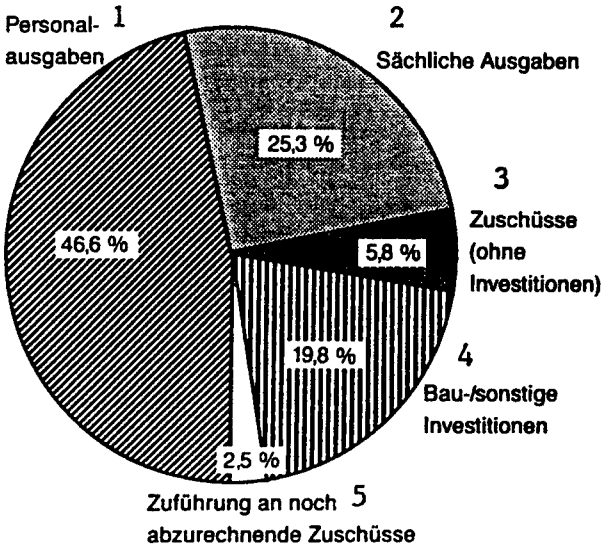
Expenditure, which is financed by the same amount of income, may be broken down as follows:

- Personnel expenditures, which rose as a result of salary increases, the approval of new posts at the Max Planck Institute of Polymer Research, and, above all, increased staff expenses in connection with funded projects, increased to a total of DM594.3 million in 1988.
- Material expenditures, which amounted to DM325.7 million in 1988, were DM8.9 million higher than in 1987.

During the year under review, subsidies of DM74.6 million were granted for special research purposes, including approximately DM27.5 million in grants for young scientists and DM18.3 million to promote scientific cooperation with other countries.

DM252.5 million were invested in building, including initial equipment for the new premises, and the procurement of scientific equipment and furnishings. The priority building projects in 1988 were the building and fitting out of new facilities at the Max Planck Institutes of Medical Research, Biophysical Chemistry,

Total Expenditure 1988



Key: 1. Personal Expenditures = 46.6 percent—2. Material Expenditures = 25.3 percent—3. Grants (excluding investments) = 5.8 percent—4. Building and Other Investments = 19.8 percent—5. Allocations for grants not yet debited = 2.5 percent

Neurological Research, and at the Max Planck Institutes of Physiological and Clinical Research (W.G. Kerckhoff Institute) and Plasma Physics.

The statement of assets as of 31 December 1988 shows a balance of approximately DM2,365.2 million, which is equivalent to an increase of about DM96.7 million (4.26 percent) over the preceding year. This increase on the assets side of the balance sheet is mainly the result of a DM99.5 million (five percent) growth in tangible fixed assets to DM2,083.8 million, and a DM6.1 million increase in business assets. These increases were partially offset by a drop of approximately DM7.2 million in floating capital. Compared with the preceding year, liquid assets, which amounted to DM21.9 million as of 31 December 1988, had decreased considerably (40.9 million in 1987).

The debit side shows net assets of approximately DM2,051.8, an increase over the previous year of approximately 4.3 percent. The balances shown as of 31 December 1988 amount to about DM8.7 million for institutional funding and DM23 million for project funding.

Max Planck Society Statement of Income and Expenditure 1988

	1988	1987
	DM	DM
Income		
General income	53,975,189.26	57,545,548.73
Withdrawal from the reserve	97,927.99	0.00
Public grants for institutional funding:		
—Quotas	1,021,600,991.93	980,577,279.88
—Special funding	23,950,000.00	26,283,000.00
Grants for project funding	153,849,080.50	142,148,594.49
Balance carried over from previous year's institutional funding	5,821,901.18	11,368,549.76
Balance of previous year's project funding	17,446,184.61	12,340,942.31
Extra project funding expenditure	2,142,739.32	1,851,450.86
	1,278,884,014.79	1,232,115,366.03
Expenditure		
Personnel expenditures	594,244,441.91	570,079,732.94
Material expenditures	325,711,748.65	316,834,243.55
Grants (excluding investments)	74,593,652.50	71,420,791.36
Expenditures for building and other investments	252,496,378.81	243,798,051.72
Allocation to reserves	0.00	802,762.15
Allocation for grants not yet debited	31,837,792.92	29,179,784.31
	1,278,884,014.79	1,232,115,366.03

The Max Planck Society's 1989 budget, which the Joint Federal and Land Government Commission on Educational Planning and Research Funding adopted by majority vote on 26 September 1988 and which has been approved by the heads of government, envisages a 3.3 percent or DM29 million increase for 1989. From the funding policy point of view, the major feature of the budget, which is jointly financed by the Federal and land governments (Budget A), is the beginning of the equipment modernization program, with an initial installment of DM10 million. The Max Planck Society had already applied for this program, estimated at DM60 million, during the negotiations on the 1988 budget. However, only the civil service pay settlement covering the 1988-1990 period created the financial conditions for extending joint Federal and Land funding to cover this program. The program's implementation will extend over several years. Another major item will be the allocation of funds for the development of new projects. Quota financing thus also covers DM27 million in operating investment funds to build up the Max Planck Institute of Computer Science. The project team on cognitive anthropology will receive a 50 percent subsidy out of special funds from the Land of Berlin, where it will be based, with the approval of the Federal and Land governments; an amount of DM0.4 million has been earmarked for this team out of basic funding for 1989. Of special significance for the establishment of the Max Planck Institute of Computer Science is the statement by the Federal and Land governments that they will endeavor to provide the required budget funds out of basic funding in the coming years as well.

The Federal and Land governments have approved 11 additional permanent posts, and 15 temporary posts terminating at the end of 1997 under the Special "Young Scientists" program, all designed to expand the Max Planck Institute of Polymer Research.

This brings the total of interim scientist posts currently at the Max Planck Society's disposal under this program to 50.

Max Planck Society for the Promotion of Science, Registered Statement of Assets and Liabilities as of 31 December 1988— Summary of Budgets A and B

I. Assets

	As of 31 December 1988	Preceding Year	
	DM	DM1,000	
1.	Fixed assets		
1.1	Tangible assets		
1.1.1	Real estate	72,495,432.57	70,059.80
1.1.2	Hereditary building rights	2,630,446.48	2,662.70
1.1.3	Buildings	447,578,233.43	439,677.00
1.1.4	Land with buildings	67,206,863.35	64,161.60
1.1.5	Building assets	82,136,431.64	84,405.90
1.1.6	Assets under construction	354,877,766.24	311,052.70
1.1.7	Facilities being build and down payments on facilities	58,499,701.90	67,090.50
1.1.8	Machines and mechanical systems	142,780,987.23	133,099.90
1.1.9	Operating and business equipment	22,499,962.25	22,163.60
1.1.10	Scientific equipment	665,613,026.90	631,566.20
1.1.11	Furnishings	68,810,052.71	66,310.60
1.1.12	Agricultural equipment	153,330.79	153.30
1.1.13	Libraries	89,476,371.81	83,696.60
1.1.14	Licenses, industrial property, and similar rights, and licenses on such rights	5,603,038.06	4,625.80
1.1.15	Tangible assets in canteens	3,402,534.00	3,542.40
1.2	Financial assets		
1.2.1	Share holdings	310,500.00	310.50
1.2.2	Credits with a term of at least four years	37,941,077.10	39,510.50
2.	Floating assets		
2.1	Inventories	29,810,392.03	27,644.20
2.2	Down payments	42,778,067.44	50,753.40
2.3	Claims	48,983,307.92	31,373.40
2.4	Cash in hand	168,916.43	132.30
2.5	Bank balance	21,330,455.32	40,619.20
2.6	Post office account balance	341,120.34	111.20
3.	Accrued assets	8,131,483.40	8,222.20
4.	Business assets pursuent to Article 216 BHO [Federal Budgetary regulations]	91,601,156.01	85,494.00
Total Assets		2,365,160,655.35	2,268,439.50
Trust Funds		11,120,763.83	12,911.70

Max Planck Society for the Promotion of Science—Statement of Assets and Liabilities as of 31 December 1988—Summary of Budgets A and B

II. Liabilities

		As of 31 December 1988	Preceding Year
		DM	DM1,000
1.	Net assets	2,051,795,571.24	1,967,221.80
2.	Reserves	2,071,379.61	2,169.30
3.	Contingency reserves	241,014,157.00	218,591.80
4.	Grants not yet debited		
4.1	Institutional funding		
4.1.1	Balance carried forward	8,429,167.23	5,821.90
4.1.2	Balance not carried forward	245,914.57	3,139.80
4.2	Project funding		
4.2.1	Federal government	7,486,170.31	8,471.80
4.2.2	Land governments	5,769,485.23	170.60
4.2.3	Other public grants	3,409,484.49	3,239.20
4.2.4	Nonpublic grants	5,897,516.39	7,462.50
4.2.5	Private assets	388,897.42	545.70
4.3	Funds for specific individuals	2,352,004.32	1,958.20
5.	Liabilities		
5.1	Liabilities with a term of at least four years	8,428,421.24	9,276.20
5.2	Other liabilities	26,502,138.16	25,978.20
5.3	Warranties withheld	434,446.19	174.20
6.	Accrued charges	935,901.95	14,218.30
	Total Liabilities	2,365,160,655.35	2,268,439.50
	Trust Liability	11,120,763.83	12,911.70

Apart from the 3.3 percent increase in quota financing, the budget for 1989 shows special financing amounting to DM27.6 million. Of this total, the Land of Baden-Wuerttemberg has allocated DM22.8 million in funding for the Max Planck Institutes of Immunobiology and Solid State Research. The Land of Lower Saxony has allocated DM4.4 million for building projects at the Max Planck Institute of Biophysical Chemistry, and the Land of Berlin will make available DM0.4 million to fund the establishment of the cognitive anthropology project team.

The Society's 1989 budget provides for expenditures amounting to DM103 million in project funding. As in previous years, the key areas are the space research, genetic engineering, climatic research, medical, specialized information, and materials research projects subsidized by the Federal Ministry of Research and Technology for a projected total of approximately DM69.3 million. Funding resources amounting to DM5.2 million are available from the private assets of the Max Planck Society and are used primarily for cancer research projects. As agreed with the Federal Government and the Land where it is located, Bavaria, the 1989 grants to the Max Planck Institute of Plasma Physics (Budget B) total DM94.8 million. It will also receive its contractual subsidies from EURATOM, which amount to DM42.1 million. The institute has, moreover, been allocated three temporary posts, terminating in 1998, under the special "Young Scientists" program. At the same time, however, it has to achieve a cutback of eight posts by the end of 1989.

Taking account of the Max Planck Institute of Plasma Physics' project funding and expenditure, the Max Planck Society's 1989 budget amounts to approximately DM1.2 billion.

As in previous years, when the Bundestag adopted the 1989 Federal Budget it decided to cut grants to the jointly financed research organizations by a sum equivalent to three percent of the capital assets of each organization. After long-drawn-out negotiations with the Federal and Land governments, this cut was reduced to 1.5 percent of material expenditures, approximately DM3.7 million, for the Max Planck Society in the 1988 fiscal year. However, a more satisfactory arrangement has been aimed at for 1989. Following a motion put forward by the heads of the Land governments, and in the light of the Federal Minister

of Research and Technology's willingness to make the cuts elsewhere in his individual budget, the Federal Finance Minister agreed that the Max Planck Society will be exempted on principle from the cut in 1989. The general administration, however, remains subject to the reduction in material expenditures.

Research Area Funding Within the Max Planck Society Based on the 1989 Budget and Taking Account of Project Funding

	Expenditure			Scientific Personnel
Research areas	Thousands of DM	Percentage	Posts	Percentage
Chemistry	132,231.0	10.7	233	11.3
Physics	403,489.7	32.6	619	29.9
Astronomy and Astrophysics	122,974.5	9.9	240	11.6
Atmospheric Sciences, Earth Sciences	52,319.4	4.2	96	4.6
Mathematics	4,602.6	0.4	4	0.2
Computer Science	10,595.3	0.9	12	0.6
Biology-oriented Research	300,612.2	24.3	473	22.9
Medicine-oriented Research	128,877.6	10.4	154	7.5
Jurisprudence	38,345.7	3.1	116	5.6
History	11,237.8	0.9	30	1.5
Sociology	12,861.0	1.0	37.5	1.8
Psychology	14,655.0	1.2	37	1.8
Linguistics	2,701.3	0.2	7	0.3
Education Sciences	2,890.4	0.2	8.5	0.4
Total	1,238,393.5	100.0	2,067	100.0

Netherlands Charts Science Policy for 1990s

90AN0173 Zoetermeer SCIENCE POLICY IN THE NETHERLANDS in English Jan 90 pp 3-10

[Article by Joost van Kasteren: "Science Policy Document Poses New Challenges: More Top People, More Cooperation"]

[Text] On the day he left office, Mr. W. J. Deetman, the former minister for education and science, produced a policy document entitled "A New Research Landscape in View." The document sketches the outlines of the government's science policy over the next ten to fifteen years. An analysis of the challenges which scientists in the Netherlands will be facing in the 1990s is followed by six main areas for attention for which specific details have been worked out.

The document is in fact a new White Paper on Science Policy. Besides focusing on the interests of society, the new document deals with issues such as cooperation in science and the optimalisation of research standards. The document does not discuss the financial aspects and, as the government was under resignation when the document appeared, no additional funds could be made available for science policy. It was unable to go further than to say that the activities mentioned in the document can only be funded by a reallocation of resources.

Another notable feature of the document is that it leaves the structure of science policy—with a coordinating minister and a separation between science and technology policy—untouched.

The new document states that the aim of science policy is to enable knowledge to make an optimum contribution to the development of society in the Netherlands. This means acquiring new knowledge and ensuring its application but also a wider distribution of knowledge in society. Scientific knowledge is so important because its availability affects all aspects of our society. It is *strategic property.* The maintenance and development of welfare and prosperity depends on this. Social questions have often become so complex that we need scientific knowledge to find solutions.

Opposing Forces

The development of scientific knowledge gives rise to opposing forces. The advance of science, notably in areas like biotechnology and medical technology, is confronting society with issues to which present values and norms are unable to provide answers. Discussion of such social and ethical problems, the document says, should not be evaded.

New Balance

In the 1980s, the application of science and technology was directed mainly towards improving of the economy. In future, however, the aim will be to find a new balance in scientific and technological research. The direction of research will be increasingly determined by ecological, ethical and other social objectives as well as economic applications. The importance of social and behavioural sciences as well as the humanities will increase. This applies not only to such fields as the environment, health and administration but also in areas where science and technology policy is greatly concerned with economic aims. This includes, for example, research into the operation of the labour market, into the effects of the implementation of technological systems and into occupational medicine. In short, science policy should help bring about balanced social and economic development in the Netherlands, in which full attention is given to the maintenance and development of the social and cultural heritage as well as to economic objectives. This calls for a policy that aims to achieve an adequate basis and infrastructure for knowledge.

European Integration

European integration seems the most important of the challenges that will arise over the next few years. It forms the first of the six issues for attention in the document. The disappearance of borders implies both new opportunities and threats. Opportunities arise as a result of the strenghtening of Europe's world competitiveness and because of improved access to European markets. There are possible threats in that competition between companies, research groups and institutes will increase in Europe as will the struggle to get hold of the best students and research workers.

A second challenge arises from the fact that the Netherlands is the home of the international research laboratories of five large multinationals. These companies are investing more and more in science and technology research. In itself this is a good thing. The presence of international commercial laboratories in the country helps keep both teaching and research in the universities at a high level. There are drawbacks, however. Cooperation with universities and research institutes means less easy access for small and medium-sized firms as well as for other groups in society. The shift from public to private funding of research in the universities and research institutes also carries the risk that fundamental and long-term research will come under pressure. Private finance, by its very nature, is interested in short-term returns. The challenge to science policy is to guarantee that universities and research institutes will be able to carry out sufficient fundamental and long-term research. Apart from its intrinsic value as part of our culture, fundamental research is, in the last resort, a major resource for longer-term applications.

Multidisciplinary Approach

Relatively speaking, too little attention is given at present to behavioural and social sciences and to the humanities. This constitutes the third challenge for science policy. Behavioural and social sciences are playing an increasingly significant role in solving social and economic questions. These sciences are also valuable in themselves.

The fourth challenge is an extension of this need to increase the attention given to behavioural and social sciences and to the humanities: the promotion of a multidisciplinary approach in research. The boundaries between the traditional disciplines are frequently breached, a process which is going to intensify in the face of the complexity of questions posed by science. It is also true that the most interesting questions are those that occur at the interface between disciplines.

Catching Up

The fifth challenge involves catching up in the areas in which the Netherlands has lagged behind over the past ten to fifteen years. Comparison with other countries shows that the Netherlands no longer occupies the leading position in the international research field that it did ten years ago. There has been an improvement since 1985 in that the large companies have started to put more money into research. But the situation remains critical in key areas such as information technology, biotechnology and new materials. As was mentioned above, this is particularly serious for the Netherlands in that it is a major supplier of human capital to the research laboratories of five large multinational concerns. The fact that the Netherlands is a small country is an additional factor in science policy because a small country needs relatively large amounts of money if it is to keep up with international developments in various fields.

Investment in Know-How

The challenges before us lead to the overall conclusion that there must be an increase in investment in know-how over the next few years. This involves strengthening "general" facilities, e.g. instituting university research courses and providing equipment and also boosting fundamental and strategic research. There will also have to be increased efforts in certain fields, such as those concerned with the environment, with physical infrastructure and with social and cultural research. This leads to the sixth and final challenge for science policy outlined in the document: the creation of sufficient support within society for scientific and technological research. The aim should not just be readiness to increase the amount of money for research. A degree of consensus on the ethical and social consequences of research must also be brought about.

Hands-off Control

In responding to these challenges, the government, and in particular the minister for science policy, has an important role to play. This relationship with the semi-public research organisations and institutes may be summed up in the phrase *hands-off control,* in which the research institutes retain a certain responsibility for their own research policy and management.

The government has a dual-track approach to research in that it deals both with institutions and with specific research areas. As far as the institutional link is concerned, the government (usually the responsible minister) maintains a dialogue with the various research organisations, in which the focus is on the main features of the institute's policy and role of the institute concerned. The government forms an opinion on the basis of recommendations from the Science Policy Advisory Council (RAWB), the future General Council for Science and Technology (AWT), and the sector councils for the area concerned.

The hands-off principle will also apply to funding. In addition to sufficient resources for fundamental and strategic research, particular use will be made of output-oriented structures (partly programme funding, partly project funding).

A different approach will be followed with regard to the specific research areas. Various institutions will be jointly involved in the dialogue dealing with the individual areas. The approach will involve interaction with research fields and the areas of application in order to establish priorities, the formation of a government view that points the way without being prescriptive, an analysis of the area concerned, reports by external experts and appropriate research organisation.

Identification

The minister for science policy is to identify, together with other ministers concerned with the relevant portfolios, specific issues in society requiring research. He may also bring interested parties together or assist other ministers in formulating new challenges for strategic research. In other words, he is to continue the role of encouraging and of being a catalyst that his predecessors exercised. It has been shown that this structure works well, although the minister must have sufficient resources.

In future the government will have to work more closely with the private sector and other organisations in society. The challenges set out in the document call for joint efforts by all concerned. The private sector and other organisations in society will be expressly involved in formulating strategic policy and drawing up priorities.

Various organisations in society will also be involved in the development of research foresight, one of the instruments of strategic policy. Moreover, sector councils have been set up to guarantee society a say in certain areas.

Clusters

The three items on the agenda for the 1990s referred to in the discussion paper "Towards a Science Policy for the 1990s" are the position of the Netherlands in the world, the interaction between public and private organisations and the relationship between science and society. On the basis of the above analysis these themes have been expressed in six *clusters* of activities for implementation:

1. the establishment of research priorities; 2. the setting up of high-quality courses; 3. participation in the process of internationalisation; 4. promotion of flexibility in structure and funding; 5. effective use of staff, equipment and information; 6. strengthening of society's involvement.

These clusters will be discussed in more detail below. First, however, a brief glance at society in the Netherlands to pick out its main features.

Features

In general terms there are two sorts of priorities, the first arising as a result of developments within a given area of science, the other out of the need for research within society. Government can only play a limited role in the first type of priority. Criteria in the second type include the need for research, the Netherlands' position in the relevant area of science and the maintenance and development of culture in the Netherlands. The nature of Dutch society and its future development also have a role to play in this.

In economic terms, the Netherlands is particularly strong in the agricultural sector. Its industry is well developed in such areas as chemistry, consumer electronics, foods and aircraft construction. The five large multinationals and certain specialised companies have good relations with both public and private research institutions. But, as was stated earlier, there is hardly any contact between these institutes and small and medium-sized businesses, who therefore spend little time or energy on research. The services sector is well developed in the Netherlands, particularly in transport and logistics. The increasing overuse of the physical structure—land, water and air transport networks and the accompanying logistics, and also international computer networks, posts and telephone systems etc.—is a problem.

In the welfare sector, the Netherlands has an education system that is of a high standard. There is also a well developed system of social services, which has come under pressure in recent years, however. The quality and quantity of health care is generally high. The development of medical technology and the changing composition of the population will bring about great changes.

With regard to the environment, the Netherlands is in a vulnerable position. The environment is under great pressure not only from the high population density and

the intensive use of the land but also from that fact that it is "downstream" from everywhere else in Europe. An intensive and multidisciplinary approach is needed to get on top of the problems. Culture in the Netherlands is pluralistic and predominantly stable and tolerant. The influx of immigrants has enriched this culture. There is a growing realisation, however, that more attention will have to be given to maintaining and developing the Dutch identity in future years, partly because of the process leading to European unity. Crime levels have decreased slightly but are still unacceptably high.

Trends

A number of trends can be discerned from this outline of society in the Netherlands. Internationalisation leads to larger markets and new opportunities but also brings about risks. Firms will have to cooperate on an international level and will be less able to fall back on a home base. Society in the Netherlands will be influenced more from abroad and some of the decision-making will take place in supranational bodies rather than at national level. There will also be a shift away from public to private responsibility. Privatisation is being accompanied by a growing awareness that the government has a role to play in giving direction to the development of strategic policy.

Alongside these trends there are other developments which will change the face of society. One of these is the demographic situation—a falling birth rate and an increase in numbers of elderly people. Technological developments are another important factor; the effect of three key technologies in particular—information technology, biotechnology and the development of new materials—will be felt everywhere.

Institute of Netherlands Culture

These features and the anticipated trends show where there will be major challenges for research. The economy in the 1990s will continue to need a strong base of knowledge from the natural and life sciences. The developments mentioned above also underline the importance of research in the social and behavioural sciences. Additional attention will also have to be given in future to the development of the humanities and contacts between it and other disciplines. Work is being done on the establishment of an Institute for Netherlands Culture.

The priority areas for science policy will be detailed in successive Science Budgets. Current thinking on future developments will be set out in exploration studies and the quality and direction of research will be regularly examined by foreign experts.

Top Research

International competition means that the Netherlands will have an increasing need for people who can act as trend setters in research as well as in other spheres in society. Part of future policy will be to produce such people through a system of high quality post-graduate training courses. Universities will have to rationalise and formulate areas of emphasis if they are to acquire an international reputation. This can be achieved by drawing up research profiles for each university or through a professional appointments policy. These areas of emphasis, however, do not have to be limited to the universities; TNO (Center for Applied Scientific Research), the large technical and scientific institutes, the National Institute of Health and Environmental Protection (RIVM) and the Agricultural Research Department will also have to be involved in this.

Centres like these will make the Netherlands more attractive for leading researchers and for prospective post-graduate students. The number of post-doctoral fellowships will be considerably increased, by between 500 and 1,000 places in the next few years.

These centers will be financed in part from a special fund to be set up for top-level training and research. They will also be funded directly from the government and through other institutions as well as by third parties, e.g. through contract research. In order to develop properly, such centres will need to have access to funds over a 10-12 year period. In the short term, a committee will be set up to make all the necessary arrangements for the programme of top-level research and training. The programme should start in 1991.

Internationalisation

A major question in matters of international cooperation is the form it should take: which areas are suitable for bilateral or trilateral cooperation, which for cooperation at European or at world level.

The main inspiration behind Europe-wide cooperation in the past has been large-scale research projects, such as CERN (European Nuclear Research Center) and JET (Joint European Torus). Increasing competition from Japan and the United States is an additional factor today. Cooperation will also be necessary in the near future to improve living conditions in Europe. A policy document is due to appear next year which will analyse developments on the European research scene. The Netherlands has also taken the initiative on a six-country forum to examine the opportunities and drawbacks of internationalisation.

Within the EC, the Netherlands will press for the encouragement of mobility among researchers and students. Finally, the Netherlands will urge European strategic projects on the environment, telecommunications and health.

In addition, the Netherlands also supports the formation of large European research facilities. Consideration is being given, for example, to a fund to attract such facilities to the Netherlands.

Outside the EC

The Netherlands also intends to work together with countries outside the EC, such as the USA, Japan, Canada and, increasingly, Eastern Europe. Accordingly, a study is to be carried out into strong research sectors elsewhere in the world with which the Netherlands could become associated. A major part of development cooperation in the Netherlands is the support it gives to the building up of a pool of expertise in a number of developing countries. The Dutch government is working together with these countries to establish long-term research programmes. It is also trying to arrange joint financing of research programmes with other donor countries and international organisations. A distinction should be made between the countries with which the Netherlands has links solely through development cooperation and the newly industrialised countries. The latter are important because of the size of their populations and their economic potential: they represent possible future markets. Cooperation with them will be much more on the basis of equality. The Minister for Science Policy and the Minister for Development Cooperation will together work out a joint policy over the next two years.

Flexible Funding

With regard to funding, long-term research and the interplay between fundamental and applications-oriented research must be guaranteed, as stated previously. Attention is being given to the question of whether basic grants give sufficient scope to engage in long-term research. Cooperation among universities or with private industry or research institutes in the form of joint ventures can ensure interplay between the various kinds of research. Long-term research must form part of the strategic policies of research institutes. Attempts will be made to make greater use of output financing.

The more complex social issues become, the more important it is that there is cooperation between disciplines. Efforts will have to be made over the next few years to bring these disciplines together. Where necessary, special institutes will be set up as part of the policy aimed at training people for top jobs. In this connection, additional support needs to be given to STIMULUS, the NWO's initiative to give increased attention to multidisciplinary long-term research.

Expansion of NWO

The importance of the NWO (Netherlands Research Organisation) will also increase in other ways. The possibility of increasing the NWO's funds so that it can finance some 15 percent of all university research is being considered.

In order to respect the principle of hands-off control as much as possible the research organisations and institutes will evaluate the effectiveness of their research themselves. The results of the evaluations will be taken into account in the formulation of subsequent policy. It is also important to evaluate the achievements of the Netherlands in various areas of research. The Royal Netherlands Academy of Sciences and Letters (KNAW) and the NWO will have an important role to play in these evaluations, while the sector councils will undertake the more socially-oriented evaluations.

Management

The institutions will henceforth have greater responsibility for managing their staff, equipment and information channels. The government's task will be to support the development of management instruments, information systems and systems for financial management. In personnel policy, the traditional passive approach will have to make way for the active management of human resources. This includes greater attention to agreements on pay and conditions and to career planning. The latter is of particular relevance in attracting top-level research staff, specialists and recent graduates. A working party will be set up shortly to look at pay and conditions in research institutes. Research facilities in the Netherlands still lag behind in the sphere of equipment. In the immediate future the institutions must have scope for proper financial management, including opportunities for building up funds, writing off and exploitation. They should pursue a policy of equipment management that aims at maximum utilisation. They should also be enabled to catch up in areas in which they lag behind. There should also be a structural policy for equipment: anticipated developments in equipment should be investigated as should the opportunities for major investments by applied research institutes. The government should also set up a study of the level of equipment provision in the Netherlands.

Information

In addition to rapid developments in the field of equipment, the institutes have been confronted with an explosive increase in information. The emphasis has shifted from the routine acquisition of books and journals to a selection of appropriate information, sometimes using computerised data bases. This has led to a growing need for information management. A study will therefore be carried out into techniques of integral information management for the use of research institutes.

The Science Policy Advisory Council (RAWB) and the Libraries and Data Provision Advisory Council (RABIN) will be asked to set out the consequences for research of the use of computerised information. The establishment of international centres of expertise will be promoted and there will be more projects for the improvement of the data infrastructure, with the aim of examining the availability and price of raw data.

Gap

The rapid developments in science and technology mean that the gap between the forefront of science and the perceptions of the general public is getting wider and deeper. Measures have been taken in recent years to

heighten public awareness of science and technology. The Netherlands Organisation for Technology Assessment (NOTA) and the Organisation for Public Information on Science and Technology (PWT) have been set up for this purpose. The aim of this policy is to increase *scientific literacy* and the extent to which people can form opinions on such issues.

The PWT will step up its special information, particularly in the schools and to the media. There will be regular surveys of the attitude of the public towards science and technology and of the level of scientific literacy.

Ethical Questions

New scientific and technological developments may give rise to ethical questions, legal problems (e.g. privacy) and questions about safety. Nature and the environment is an area in which issues of safety are raised. The main concern is to set standards for certain dangerous substances. Biotechnology raises questions of both safety and ethics. The latter also arise in the field of medical technology.

It is very important that discussions about ethical aspects and standards and regulations should be frank and thorough, both among scientists and members of the public. One possibility is discussions with professional groups and another is for NOTA to give more attention to the ethical aspects of research.

Ethical advisory committees will also be set up along the lines of the medical ethics committee at university hospitals and the ad-hoc committees for assessing experiments on animals.

Finally, the Netherlands will promote discussions on ethical issues at the international level.

Fiat Official, EC's Pandolfi Discuss R&D Policy

90AN0163 Brussels EUROPE in English 26 Jan 90 p 12

[Report: "Fiat Has Presented Its Fifth 'European Notebook' Devoted to 'European Research Policy in the 1990s'—Catching Up With the US and Japan"]

[Text] Fiat today presented to the press its fifth "European Notebook," devoted this time to "European Research Policy in the 1990's" (preceding notebooks concerned the single market, technology, competition policy, etc.). The presentation was made by Mr. Annibaldi, responsible for the group's external relations, and by the vice-president of the European Commission, Mr. Pandolfi.

Mr. Annibaldi stressed that there is now unanimous agreement on the fundamental importance of research so as to ensure the competitiveness of Community industry and the European economy in general. This consensus is not enough, however; it is essential to make it concrete. Research expenditure is increasing in Europe less rapidly than elsewhere—Mr. Annibaldi mentioned the following average rates of expansion for the last few years: up 3.6 percent in Europe; up 6.6 percent in the United States; up 8.8 percent in Japan. This tendency is not reassuring and everyone—institutions, scientific and university milieux, and industrialists—must work together to see how to improve the situation at all levels and especially at the Community level, taking into account the fact that henceforth certain research can only be done on a multinational level. This implies a better integration of effort, which in Europe is currently dispersed among several "national research systems," whereas the United States and Japan each acts as a single entity.

Community action must necessarily be coordinated with national efforts; in addition, universities and industry must be closely associated with this effort. According to Mr. Annibaldi, the EEC must continue and emphasize its effort to move from fundamental research to more market-oriented research. Of course, EEC research must remain "precompetitive," because the Community cannot give advantages to one industry or another; but there is an important margin of action in the zone between fundamental research and competitive research, and it is in this zone that the Community must act. But the study also affirms that "industry is having difficulty understanding the precompetitive constraint" and recalls "that the success of the EUREKA program does not impose this constraint and its projects often reach the threshold of industrialisation."

The Fiat study also stresses that a strong "university polity," which can use all available resources, will eliminate the considerable differences among various European universities by creating a more solid link between research and higher training. It is also important to go beyond national particularities and the egocentric visions oriented to protecting local advantages.

The study concludes by suggesting the constitution of a European system of technical support structures allowing rapid and effective development of the best solutions at the integrated European level.

For his part, Commission Vice-President Mr. Pandolfi outlined the main points of Community action in the field of research: better coordination of investments, use of the Single Act as the legal basis, Community participation in EUREKA, and the new 1990-1994 Framework Programme. Special development is devoted to two EUREKA projects that are particularly significant for industry: the JESSI [Joint European Submicron Silicon Initiative] project (integrated circuits) and the HDTV (high-definition TV) project.

The last part of the study contains an analysis of the development of Community research and technology policy with comments on the role of the European Parliament by Mr. La Pergola, president of the Energy and Research Committee of the European Parliament.

The study's authors emphasize that it was drafted before the Council reduces, in relation to the European Commission proposal, the financial appropriation for the

1990-1994 Framework Programme. This decrease confers "even greater currency to the ideas...that lead to reflection on the financial level necessary to attain the critical mass in European research and development," according to the authors of the study.

Italy: Funding for New CNR Programs

90MI0065 Milan ITALIA OGGI in Italian 16 Nov 89 p 40

[Text] The CIPE [Interministerial Committee for Economic Planning] has recently approved five new CNR [National Research Council] finalized projects on genetic engineering, aging, the prevention and control of pathogenic agents, and advanced research for agricultural innovation.

The overall financing for the five-year projects totals 430 billion lire. The first project on genetic engineering, coordinated by Glauco Tocchini Valentini, director of the CNR's Institute of Cellular Biology, will be allocated 46.6 billion lire. The goal is to develop and acquire a better knowledge of the basic techniques of genetic engineering, such as cloning and gene sequencing. The five subprojects will deal with new carriers, gene expression and amplification, the genetic engineering of eukaryotic organisms, hereditary diseases, and the mapping and sequencing the human genoma. Renato Dulbecco, Nobel prizewinner and director of the CNR's strategic Genoma project, will be responsible for the last subproject.

The project on aging directed by Luigi Amaducci, professor of neurology at the University of Florence, will be allocated almost 59 billion lire over a five-year period. The goal is to define the characteristics of aging processes by studying biological changes and modifications in the quality of life. The subprojects will deal with the relationship between aging and metabolic disorders, the aging of sensory and cognitive processes, epidemiological studies in gerontobiology, and the quality of life and self-sufficiency. Giorgio Ricci, professor of medical therapy and systematics at the University of "La Sapienza" in Rome will direct the project on the prevention and control of pathogenic agents. The subprojects will deal with nutrition, the quality of the environment and health, the causes of infectious diseases, stress, fertility control, community medicine, maternity-related diseases, heart diseases, and the study of drugs to treat AIDS.

The project directed by Enrico Porceddu, professor of agricultural genetics at the University of Cagliari, has been allocated 226 billion lire. The project focuses on innovations for the agricultural system and is divided into four subprojects. These involve agricultural systems and environmental conditions, and agrobiotechnology in vegetable and animal production and in processes designed to improve agricultural products.

SUPERCONDUCTIVITY

FRG: Research Group Established

90MI0071 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 515, 15 Nov 89 p 6

[Text] In conjunction with science and industry, the government of the Land of Baden-Wuerttemberg intends to intensify the basic research on superconductivity already carried out extensively within its territory. This is the task of the "Society of Applied Superconductivity" (GAS), whose board of trustees has just been appointed.

The Minister for Trade and Industry, Small and Medium-Sized Companies, and Technology, Hermann Schaufler, has stated that GAS's task is to support scientific and technological development in the field of applied superconductivity, increase the exchange of information and knowledge between industry and scientific institutes, and rapidly convert research results into industrial applications.

According to Schaufler, the new society complements the technology transfer network that was built up in this important key technology of the future under the Land's technology policy. The minister is convinced that their almost loss-free energy transport will make the new high-temperature superconductors a key technology of the future for power engineering, the computer industry, aerospace engineering, and the medical field.

Professor Rietschel, from the Karlsruhe Nuclear Research Center, has been appointed director of the society, which will also have its headquarters in Karlsruhe. Preparations are thus complete, and the society is ready to begin work.

Along with the Land of Baden-Wuerttemberg, the following firms are members of the society: Asea Brown Boveri AG, Robert Bosch GmbH, Bruker Physik AG, Daimler-Benz AG, and Leybold AG, as well as the Karlsruhe Nuclear Research Center GmbH. The Land will bear half the operating costs, and the remaining half will be borne by the other members.

The board of trustees, on which the universities of Karlsruhe, Constance, Stuttgart, and Tuebingen are also represented, plays an important leading role in the society. Professor Huebener, from the University of Tuebingen, has been appointed chairman of the board. His deputy is Professor Laukien, from Bruker Physik AG in Rheinstetten-Forchheim.

Membership of the society is open to other participants from science and industry with headquarters in the FRG and West Berlin that engaged in superconductivity R&D.

TECHNOLOGY TRANSFER

FRG: Volkswagen Foundation Announces Funding Programs

90MI0078 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 516, 30 Nov 89 pp 7-8

[Text] The Volkswagen Foundation has announced new initiatives in science funding. In the expectation of promising developments for science in the GDR, the board of directors has announced decisions that include an emergency program for improving the infrastructure of universities and technical universities in the GDR, with an initial funding of DM10 million. The Volkswagen Foundation also anticipates that this decision will act as a incentive to other science funding organizations.

The foundation's new program on "Photonics: Materials, Physical and Chemical Principles, Components, and Integration," is designed to encourage physicists, chemists, and engineers to cooperate on an interdisciplinary basis in the largely unexplored borderline area of physics, chemistry, electronics, and technical optics.

The priority program on "Improving Infrastructures in the Engineering Sciences," launched in 1981, will end on 31 December 1989. No applications received after this date will be processed.

The foundation will still maintain the contacts established over the last few years by continuing, in a considerably reduced and modified form, to fund its "China Program" both in the natural and engineering sciences and medicine as well as in the arts and social sciences.

The board of directors has approved a total of DM94.4 million, which includes DM37.2 million for Lower Saxony, on the basis of a proposal from the Lower Saxony Land Government.

Hungarian Contract Programmers Acquire FRG Know-How

90CW0114A Munich HIGHTECH in German Jan 1990 pp 22- 23

[Article by Ulf J. Froitzheim: "Map Square: Puszta"]

[Text] For years, Hungary was cut off from access to advanced computer technology. Now, thanks to the political opening, the Magyars are making up for lost time. Budapest is counting on the Western know-how of returning contract programmers."

There was no getting around the concrete fraction in the Coordination Committee for Export Monitoring. The cold Cocom warriors fought bitterly so that no holes were punched in the Iron Curtain—at least not by the exporters of technologically interesting goods. However, in matters concerning Hungary, the Paris Institution established by NATO is slowly running out of arguments—and not just because the land of the Puszta would rather forget its socialistic past. Clever Hungarian EDP experts long ago paved their back roads to western know-how.

While western officials tried to prevent the delivery of advanced computer systems to the Eastern Bloc, hundreds of highly qualified computer scientists flowed into western Europe—and, as software contract workers with official work permits, often had access to the newest hardware. "Of course, nobody looked the other way," confesses Gabor Halasz with a wink. The representative of the Budapest EDP conglomerate Szamalk can, for this reason, place inexpensive Hungarian programmers with users in the Federal Republic of Germany by way of its German partner, Datorg GmbH in Geesthacht near Hamburg. These programmers are acquainted with the most current computer systems from IBM, Siemens, Nixdorf, Bull up to and including Digital. Such EDP guest workers, who often only stay in the Federal Republic for the duration of one project and then return home again, play a key role in the reconstruction of the Hungarian political economy.

"Our people should get more opportunities to work occasionally in western countries," wishes Robert Peller, the No. 2 man in the management of the EDP Central Office of Szamalk that will not be run by the state in the future. Primarily, the Hungarians have their eyes on the Federal Republic in which inexpensive but still qualified software personnel continue to be scarce. Peller's idea: "Our new generation must gather experience in projects from various software houses as fellowship holders or as junior managers." However, here the first item on the agenda is to eliminate hurdles built up by the legislators of Bonn years ago.

According to the agreement currently in effect, about 2500 workers from the Hungarian Republic may be employed in the country, and the softworkers form only a small group of these. Only in the most recent time has there been movement in this matter: in the future—according to the proposal of one project group including, among others, representatives of both governments and the German Federal Employment Agency—this number should be treated as an annual average. Then, more experts could be used in German companies on a seasonal basis. There are plenty of takers for this potential work force as the Hungarians are seen as modest and efficient.

That Hungarian computer scientist come equipped with an excellent initial base due to their sound theoretical knowledge is undisputed in the branch. Because of this, the EDP expert Laszlo Tarnai, who has lived in German exile since 1956 and is currently the owner of R+S, a Munich software company group, is not the only one who likes to work with personnel from his home country: "The basic education of the organization programmers is much better than in Germany. For this reason these people catch up here very quickly, even if they are not familiar with the state of the art."

Even Harry Sneed, manager of SES Software Engineering Service GmbH in Ottobrunn near Munich and known as one of the most profound authorities on the Hungarian EDP scene, has the following praise: "The Hungarians were always very advanced in software technology. Unfortunately, they were disconnected from western hardware technology after the Russians marched into Afghanistan." For this reason, IBM in 1980 was not allowed to deliver a mainframe computer that had already been paid for to an academic working group which at that time was being trained in Budapest by American instructors.

The result of the technology blockade that, after hardline Eastern Bloc dictatorships, also hit the unorthodox goulash communism: "The best people," according to Sneed, "went West." So as not to become obsolete, the cream of the mainframe experts left the country. Of course, many remained in the vicinity—they moved to Austria. The technology refugees were particularly well-received in Vienna. Janos Sved, manager of the middle-class program workshop ISF Software Service, gushes about his countrymen: "They can work on a world-class level because, in Hungary, the EDP experts are almost all academics. They learn much quicker than the average person and work much more efficiently." The only problem seen by the Austrian-by-choice is the language barrier. Virtually all the top people who can speak German are already in the West. Sved uses an alternative that his branch colleague Gabor Halasz also likes to use: "If we have projects that can be well-defined, we have them developed directly in Hungary."

When Halas makes an offer to his customers, on the one hand there is the possibility that an Hungarian team develops the program at Datorg in Geesthacht or on the customer's premises; on the other hand the Szamalk man also uses project teams in Budapest. This is least expensive and brings more hard currency into the country. "In most cases, however, the colleagues come to Germany." In the mean time, there is a new boom thanks to the somewhat more liberal application of the Cocom rules to microcomputers: a younger generation of computer scientists, not quite so familiar with mainframe computers but who know how to use words like Microsoft, Wordperfect, and Lotus 1-2-3, is very much in the news.

In the opinion of the software expert Harry Sneed, "In the PC area, the Hungarians have, of necessity, built a new group of specialists but no young Hungarian still works for any kind of state institute." Now, "highly qualified people" are moving into the western market on their own. The image that these member of the next generation have of German everyday business does not always match reality. And not all of them want to leave their country to get hard German marks. They design programs that should only be sold in Germany.

In the assessment of the Munich EDP consultant Norbert Marks who, together with a number of partners, now wants to provide an initial impulse to such founders: "The Hungarians produce something without knowing how the market functions here. They hope to make big money but their software products cannot be used here." In parallel with this, young computer scientists who often started their career in a large state-run company such as Szamalk, try their luck by letter or by way of brokers.

"We are getting more and more applications for employment from Hungary," says Hans Kutgen. The leader of the software tools product area of the AEG subsidiary GEI in Aachen is not the only one having this experience: Softlab GmbH in Munich is also receiving regular inquiries from brokers offering inexpensive employees. A programmer hour in the Federal Republic usually costs at least 120 marks. The softworkers from the East cost only 60 to 90 marks. Softlab marketer Heinz Wieler is reserved with regard to offers of this type: "We do not even check the offers because our contracts forbid us to send work outside without the customer's approval."

In addition, the inexpensive Hungarian programmers already have competition. "We have already received calls from Chile, throughout the entire GDR, from Yugoslavia, India, or Pakistan and if an Indian will work for 30 marks, even an Hungarian is no longer worthwhile," in Weiler's evaluation. GEI manager Wolfgang Schonfeld sees still other perspectives when Hungary is mentioned: "By the middle of the 90s, there will be an interesting market for the German software industry in the East." With appropriate attention, the EDP branch is watching the economic development between Budapest and Szeged. Not even the optimists believe that the market will change as rapidly as the political landscape. Thus, Andras Visnyei, manager of SSG Software Service Gesellschaft in Munich and once a manager in the IBM subsidiary in Budapest, warns: "Companies that wish to invest in Hungary should know that they first must create a market." Wolfgang Dernbach, in the management in the Frankfurt EDP consulting company Diebold Deutschland responsible for Hungarian business, does not await a breakthrough until after the delivery obligations in existence with regard to other Comecon countries run out. And most of these are based on 5-year plans. Dernbach's prognosis: "The Hungarian market will explode in three to four years."

Swedish Technology Centers Seek Research, Market Expansion

90CW0114B Munich HIGHTECH in German Jan 1990 pp 78- 83

[Article by Hans Joachim Fuchs]

[Text] A dense network of technology centers is covering the southern Swedish region of Malmo/Lund. This is creating new companies now looking for buyers for their know-how.

A depressing scenario must have presented itself to the promoters of economic development: bankrupt shipyards, drastic cuts in the textile industry due to Asian

competition, and stagnation in rubber and cement production. Crises of several important branches at once made the politicians at Malmo and Lund very nervous at the beginning of the 80's. The call for a technology fire department became louder and louder. For this reason they rolled up their sleeves to make the economy toe the line. The concept, which is just as simple as it is effective: concentration of all resources on the only university in the region, massive support of know-how transfer from the college into the new technology park Ideon, and generous support of spin- offs from science using industrial means.

In this manner, the Malmo/Lund region advanced within a few years to a breeding ground of innovation that still serves as a model for many technology centers in Europe. Japanese scouts, scientists from all over the world, and delegations of politicians grasp the door handle here. "They all want to see how technology transfer functions properly," says Ulf Andersson, R&D manager in the Ideon technology park. In Malmo and Lund, industry obviously defines all the playing rules of science. Research results from the college that can be exploited industrially, combined with venture capital, entrepreneurial spirit and pragmatism, were the fertile soil for a growing number of company foundings in this Swedish backwoods. Because there were not enough professors at the university, college teachers were plucked from industry thereby providing for an even faster conversion of scientific knowledge into new methods and products.

"We not only developed technologies, but also aggressively searched for new areas of application," is how Andersson explains the recipe. Thanks to the massive commitment of Swedish industry—primarily ABB, Ericsson, Volvo, Saab-Scania and Astra Chemie—a complete network of technology centers with specific focal points was created in Malmo and Lund:

- The basic unit of southern Swedish peak technology is primarily the University of Lund, just 17 kilometers from the industrial city of Malmo and, with 26,000 students, the largest college in northern Europe. The first technology park of Sweden, Ideon Lund, is affiliated with this university. The technology park is home to about 100 young high-tech companies on an area of 60,000 square meters. However, these companies may only do research and development, not production.
- More potential is available in the 15,000 square meter-sized Ideon Industrial Park in Malmo. One dozen companies build prototypes and small series here. More and more service activities for marketing and sales also prosper there.
- Ideon Malmo, in the immediate vicinity of the Central Hospital and College of Dentistry of Malmo, concentrates on medical technology, pharmacy and technology for the handicapped and rehabilitation. Focal points for the companies located here are medical image analysis, ceramic materials for bioimplants and computer tomography.
- A particularly promising branch of the souther Swedish scene is Ideon Agro, a center for agricultural breeding and foodstuff research founded in 1986. In addition to scientific projects concerned with the cultivation of raw material for industry, marketing concepts are worked out here and continuing-education seminars offered.

Focal Points in the Field of Modern Chemistry.

So as not to become part of the background in the concern of European high-tech regions, the innovation strategists in Malmo and Lund are thinking more and more about the classic focal point of their university. Nothing is valued higher there than chemistry with the three large application areas of medicine, the environment and biology. Alone in the chemistry center of the college, 50 professors perform a broad spectrum of basic chemical research, for example in dialysis medicine, foodstuff technology or waste chemistry. The range of products from young companies in the chemistry scene extends from non-radioactive detectors for genetic research (MBL International AB, Malmo) via electrochemical sensors for environmental protection (Beta Sensor AB, Lund) up to highly sensitive analysis equipment for cell research that may be used to insert active substances directly into individual cells and to extract cell liquids (Carnegie Medicin AB, Lund). The newest hot topic of the southern Swedish chemists is the development of a coating material that prevents all types of biological deposits on a firm substrate—on teeth as well as on boat hulls.

"German-Speaking Countries Are Half the World"

The expansion of high-tech disciplines is proceeding smoothly: In May 1990, a brand new center for plant genetic research and molecular genetics will open its doors in Lund and even the material research, semiconductor physics and laser technology are to be increased in the university. The university president, Hakan Westling: "Our scientific departments have not yet reached the critical mass necessary to keep pace with competition." One of the shining stars of the many spin-offs from the university chemistry research is without a doubt Munters Zeol AB in Lund. The company, created from the zeolite research section, developed in the middle of the 80's an absorption method for removing pollutants stemming from solvents, for example butanol, propyl benzene or ethanol, from the air. The first contract for exhaust-air purification came from Volvo. In the mean time, however, Germans are the primary customers: Munters Zeol is not only cleaning the exhaust air of the Hamburger Raffinerie of petroleum benzin fog, a test system was started in 1988 for Daimler-Benz AG in Sindelfingen.

It sounds modest and like an understatement when they say they do not feel ready to meet German requirements and do not want to make fools of themselves due to mediocrity. "The Germans are perfectionists and only take the best," complains Svante Wallin, head of Opsis

AB in Lund. Within the framework of a university project, the young physicist developed a method for the chemical analysis of gasses. It is based on the measurement of absorption and the modification of light due to impurities and is used mainly for analyzing air pollution. The principle: A xenon lamp emits light. The components of this light are changed or absorbed completely by the molecular structures of the various pollutants. The modified beam of light is received at the end of the measurement system by a sensor, sent to a spectroscope by way of fiberglass cables and analyzed by an EDP system that can identify up to 40 pollutants. The result is a type of spectroscopic finger print of the air that reproduces exactly the combination of pollutants present. Because the impurities are measured not at one place but rather along a section that is several kilometers long, the method does not only determine a punctual result but also all impurities and the maximum concentration of pollutants.

Magnus Bolmsjo, manager of Lund Science AB that specializes in medical technology, also cast sidelong glances at the German market. "The three German-speaking countries are half the world for us," confirms the physicist. Together with his four employees, he is preparing, in cooperation with the Buchler GmbH of Brunswick, to bring a new method of cancer treatment to the market. In this method, after the radiation treatment the tumor is heated with microwaves and the efficiency of the classical radiation therapy is dramatically increased. Per Sjoberg manager of BioCarb AB in Lund is interested in cooperation of a completely different type.

The 20 employees of the young company, all specialists in hydrocarbon chemistry, produce monoclonal antibodies and developed high-grade substances for the diagnosis and treatment of cancer and infectious diseases. Because the cost for research and development in this area are extremely high but mass production is not permitted in Lund, Sjoberg is limited to providing know-how and is looking for high- caliber partners that can convert his ideas into finished products. Sjoberg formulates the desires of the southern Swedes like this: "The Germans should buy our ideas and make products of them. That would be the best cooperation."

SIDEBAR Fear of Flops in Germany The extremely high tax burden in Sweden (marginal tax rate: 72%, income tax: up to 52%, value-added tax: 22%) makes even the Malmo/Lund region not exactly the most sought-after address for German company settlers. "With us, you must work from January to October only for the taxes," complains Inge Karl Gustav Bjorkman, state secretary responsible for industrial development in the Malmo city administration about the tax system. The system is to undergo basic reform in 1991. The region also sees no state technology support and investment help for R&D-oriented companies so even the domestic companies call for foreign venture capital. The massive support for high technology in recent years has led to a broad assortment of know-how that cannot be exploited in its own country. A lack of production capacity and the domestic market that numbers only eight million consumers force southern Swedish high-tech companies to look for partners outside the country: licensees, producers and buyers.

In this respect the Federal Republic is approached very cautiously. "If the Swedes fail on the German market, their image in Europe is down the tubes quickly," says Rainer Herrmann from the Swedish Trade Office in Hamburg to explain the reticence of his clients. For this reason, many young entrepreneurs like to offer mature R&D results, sell themselves as external development departments or wish to sell the entire company. Contract research on a very high level is inexpensive in Malmo and Lund: a scientist costs just 70,000 marks a year.

French Research Minister on European Competitiveness

90CW0114C Munich HIGHTECH in German Jan 1990 pp 84- 85

[Interview with Hubert Curien, French Minister of Research and Technology by Friedrich Brauninger and Jan Hohn; date and place not specified]

[Text]

"European Alliances Must Not Align Themselves Against Partners in the USA"

HIGHTECH: Mr. Minister, where is European research four years after the start of the Eureka program and two years before the arrival of the huge European domestic market?

Curien: In the area of basic research, we are roughly equal compared to the USA, I even see a solid lead over Japan. However, in applied research concerned with translating the basic results into products and services, the situation for us European is far less rosy. The considerable Japanese efforts in the area of industrial research and the development of production techniques are paying ever increasing returns. Winning territory in this sector is thus at least as important as the leads in basic research.

HIGHTECH: In the central key technology of microelectronics, Eureka has been a bitter disappointment up to now. The lead of the Japanese looks more like it is increasing.

Curien: I do not view that quite so pessimistically. With Eureka, the primary intention was to motivate European industry to more cooperation in research and development. Such wide- spread cooperation, such as German, French, and Swiss companies, operates today much better than before the start of this program. In strategically important areas, intra-European bridges have gained significant importance and replaced the top-heavy orientation on the USA. That not absolutely all expectations of Eureka were satisfied does little to change the basic success.

HIGHTECH: However, there can be no talk of success in the dramatic dependence of Europeans on Japanese microelectronics suppliers. Do you not expect this problem to become worse before it becomes better?

Curien: Indeed, no other topic gives us so many headaches. If our companies merely attempted jointly to reduce the Japanese lead, that would be a basic error in my opinion. Europe must be able to exist in the tier of microelectronics over the medium term. That, however, because of the current initial state of affairs, is only possible if we set higher goals lying far beyond the current state of performance of the competition from the Far East.

HIGHTECH: To be successful at this, the joint project JESSI is not sufficient?

Curien: JESSI is without a doubt the right start. However, the goals of research and development must go beyond what the competition can already do or can almost do.

HIGHTECH: What possibilities do you see for Europe closing ranks with the USA in the area of microelectronics?

Curien: IBM would like to participate in JESSI; I myself have a positive opinion regarding cooperation with the American Sematech program in Austin and count myself in the camp of supporters for such a rapprochement. Of course, this applies always with the reservation that our interests are kept in mind because we are keeping an eye on all non-European competition. The Sematech consortium is attempting to make progress with respect to Japan primarily in the production technology area. In this respect, we could jointly gather our strength completely and march in this direction.

HIGHTECH: The Japanese are making themselves more and more at home in excellent European research institutes. How then do you evaluate this development?

Curien: That is indeed a highly explosive problem because, through this action, a wealth of know-how is lost to powerful competitors. It is just as good advice for us Europeans as for the Americans to follow this interest in our top laboratories very closely.

HIGHTECH: What is your counter-strategy to stop the creeping erosion of European R&D fields?

Curien: It must be prevented that we Europeans lose many of our home-made advantages to our Japanese friends. Even if developments and markets can be defended much better, protectionist maneuvers have little effect over the long run, and anti-Japanese doctrine would be basically false. We should rather attempt to form a parade using efficient production technology.

HIGHTECH: Thus, better to run with them than to build barriers?

Curien: Certainly. If we or the Americans are not able to keep pace where the Japanese are making points, I am not optimistic. Rigid protectionist measures in the research area are not a workable solution in any case.

HIGHTECH: This then also applies to the areas of space travel technology where hot competition is starting between the Americans and the Europeans. How nervous does the new master plan of NASA that provides for a return to the moon and missions to Mars make you?

Curien: I doubt whether the Americans can be motivated for the new moon project in a way similar to that for the Apollo program. In spite of this, a station or settlement on the moon is only a question of time because of the considerable scientific value.

HIGHTECH: What should the European position be to this plan?

Curien: The question of financing must be answered on the other side of the Atlantic. In this case, we must keep a cool head and not set the level of expectation for industrial exploitation of such projects too high. The Europeans must first delineate their own space travel objectives. Our position with regard to the space shuttle, Ariane and commercial and scientific satellites must not be weakened in any case.

HIGHTECH: In the Federal Republic, criticism is increasing that primarily the French are profiting from the European space travel programs.

Curien: That is without a doubt correct because France has made the greatest effort in comparison to other countries and is completely committed to this technology. We were laughed at for a long time because of this.

HIGHTECH: Now the merger carousel is turning. What do you think of a close connection between the Daimler group and Matra, Aerospatiale or Dassault?

Curien: Closer connections are thoroughly desirable as long as they are not detrimental to other interesting potential cooperative efforts. Under no circumstances do I want European alliances to be a burden to the cooperation of our companies with American partners. It is much more practical to unite our strength so that it utilizes the cooperation with overseas partners.

HIGHTECH: Behind this is again the French intention of skimming off the cream. Do you trust the German Agency for Space Travel Matters (DARA) to hold up their end here?

Curien: The DARA is the counterpart to our French space travel agency Cns which was unique in Europe for a long time and converted large-scale projects such as Ariane or the earth observation satellite Spot into reality. The founding of DARA will doubtless have an effects on the distribution of contracts and responsibilities in the

European circle. However, why shouldn't both organizations maintain close contacts with one another? Things function already today without many hitches.

HIGHTECH: For all that, more and more opposition in the camp of industry is being seen against the immense sums being expended for space travel technology.

Curien: The expenditures for civilian space travel will increase even more. Cuts could easily be interpreted here as a sign of a lack of interest in research, development and top technologies. The mobilization of efforts in other R&D sectors would then be much more difficult to achieve. Space travel is one of the decisive prime movers for technological progress. Nothing about this will change, even in the future.

TELECOMMUNICATIONS R&D

Italy's Selenia Using GaAs Technology for Satellite Project

90MI0126 Rome SPAZIO INFORMAZIONI in Italian 15 Jan 90 pp 3- 4

[Text] Since 1982, Selenia Spazio and Selenia Industrie have worked on the Monomic project under contract for the Italian Space Agency (ASI). This project has involved the development of a microwave convertor (using so-called monolithic technology) to be used in small receivers for live television via satellite. The results of this study were recently presented in Rome, at a conference attended by the General Manager of ASI, Prof. Carlo Buongiorno and the Managing Director ot Selenia Spazio, Dr. Andrea Pucci.

The goal of the monomic program was to develop a high technology, GaAs receiver for TV signals transmitted directly by satellites in geostationary orbit. The project began in 1982, with a contract for technological development involving the CNR's [National research Council] National Space Plan and the Italtel, CISE [Center for Data, Studies, and Experimentation], and Selenia industrial consortium. The first stage concerned acquiring specific expertise (in particular by CISE and Selenia) in the field of GaAs circuits and components. The Higher Institute of the Post and Telecommunications (ISPT) also participated in the program with tasks related to technical regulations, while the Turin-based RAI [Italian Broadcasting Company] research center carried out extensive testing. The second stage began in 1986 with a contract between ASI and Selenia Spazio and Selenia Industrie for: 1) the development and engineering of the receiver, complete with antenna; 2) the development of extremely low mixer noise entry stages and a medium frequency amplifier by using GaAs technology; and 3) the refinement of GaAs technology in the extremely low noise entry stage and engineering of the whole equipment.

In Rome experts from Selenia Spazio and Selenia Industrie presented the results of the entire program (with an overall cost of approximately 5 billion lire) and the prototype of a receiver. They demonstrated its capacity to receive TV signals transmitted from the European Olympus satellite. "The goal of this study," stated Dr. Pucci, "was to develop technology for later use. This goal has been achieved. We are now waiting for industrial partners involved in the civil electronics sector to enter the field and face the marketing issues." On the other hand, it is clear, that "if someone does not decide to develop SARIT (Italian Broadcasting Satellite)," Pucci stated, "a market for live television reception via satellite is never going to develop in Italy." The SARIT program has been sitting in the offices of the Ministry of Posts for a long time now. It provides for the development of three satellites (two in orbit and an extra one on earth) to be launched beginning in 1993. Their capacity will be four to five high power television channels and other auxiliary channels for telecommunications. The current program, assuming that SARIT is approved within the next few months, involves launching the first satellite in the second half of 1993 (and the Olympus TV channel available to RAI would act as a spare to guarantee a working service). The second would be launched in 1994-95. According to experts at Selenia Spazio, this solution would make it possible to spread out investments over time, reduce the economic risk in case of launch failure or breakdown in orbit, reduce launching costs, and use the technology for future satellites.

Italy: New Optical Computing Research Program Under Study

90MI0124 Milan ITALIA OGGI in Italian 30-31 Dec 89 p 32

[Interview with Mario Martinelli of CISE by Michela Fontana: "Optical Computer Studies in Italy Too;" date and place not given]

[Text] Optical computing (the optical processing of information) or photonics (electronics produced with particles of light called photons) is an area of study which for years has attracted a growing number of researchers worldwide and is now beginning to attract interest in Italy.

A National Research Council committee is currently completing a feasibility study on an all-Italian photonics finalized project which could begin within the next two years in cooperation with the Higher Institute of the Post and Telecommunications.

The project contains, in a broadened form, some of the themes already dealt with in the telecommunications program which is now in the development phase. "Photonics is an important sector which is gaining growing attention worldwide," explained Gianni Fabri of Italtel, president of the committee for the feasibility study and president of the CNR's computer science and technology committee. "It means being able to identify and concentrate on themes which have more applications and industrial importance."

A member of the commission for the feasibility study, Mario Martinelli, who is head of CISE's [Center for Data, Studies, and Experimentation] Segrate-based "coherent optics" department was asked to comment on the project's themes.

ITALIA OGGI: Why should Italy concentrate on research themes which are still so far from becoming applications?

Martinelli: Even Italy should break into new areas of research rather than catch up on research. The applications of photonics may still seem very distant but even if only a small part of these studies find commercial outlets, the advantages for telecommunications and data processing would be enormous. It would be logical therefore to take a risk and work for the future.

ITALIA OGGI: What does photonics mean?

Martinelli: This technology is designed to translate into optical terms, by using particles of light called photons, the same type of data signals that are currently processed electronically using electrons.

ITALIA OGGI: Where does the interest in this technology come from?

Martinelli: Photonics came about as a result of the success of fiber optics. Now, optical fibers account for 99 percent of the new cable installations used for telecommunications.

From this a need arises to process the signals that travel along the fibers optically and not electronically as now occurs. In addition, optical fibers have an enormous band availability which is currently unused but will be in the future. For this reason it will be necessary to develop new optical components that can manage the great flow of information.

ITALIA OGGI: What are the themes of the photonics project?

Martinelli: Three subprojects are planned: optical switching, transmission, and computing or, in other words, processing.

All of the signal manipulation is carried out in the so-called switching nodes located along the path of a fiber. New architectures and devices must be developed to complete all the operations that take place inside the switching nodes.

Optical switching devices are potentially faster than electronic devices. They can reach speeds of picoseconds which means one trillionth of a second. This is two or three orders of magnitude greater than electronic devices.

ITALIA OGGI: What research is planned in the transmission sector?

Martinelli: The optical method should be studied, as a means to regenerate and amplify the signal along its course. For example, exploring the new possibilities offered by photon transmission is also important, by investigating how solitons (impulses which remain unaltered even for hundreds of kilometers) propagate.

Another area of research concerns optical connections. Both chips and processing files can be optically connected. Even the different components found within a single chip can be connected optically.

The connections are very important because if they are not developed in response to new processing requirements, they can represent a bottleneck for the signal and force it to slow down.

ITALIA OGGI: The last theme concerns the optical computer. What are the advantages of the optical processing of information?

Martinelli: The advantages are many. Above all optics allows for parallel processing because of the same kind of signal propagation. It is therefore natural to conceive of using light for new highly parallel architectures such as neural networks. In addition, optical signals can be easily combined without experiencing cross talk problems that is, without interference.

ITALIA OGGI: Why, therefore, with all these advantages, is it so difficult to develop an optical computer?

Martinelli: From the early 1960's until the 1970's, analog devices were developed for the optical processing of information. However, electronics, which had experienced continuous progress, always outranked optics. Only in the early 1980's, thanks to the conception of new so-called bi-stable optical devices, did systematic experiments on the digital processing of optical signals begin. This field of study is very promising, even if we are still far from practical applications.

ITALIA OGGI: At what stage is photonics research if compared to the development of optics?

Martinelli: I would say that we are still at the preliminary stage, but with a great deal of very good ideas to make rapid advances.

Italy: Earthnet's Role in ERS-1 Program Described

90MI0123 Rome AIR PRESS in Italian
3 Jan 90 pp 33-34

[Text] ESRIN's [European Space Research Institute] Earthnet Program Office (the Frascati-based agency which collects and processes satellite-transmitted data and makes it available to both ESA and nonmember countries for their analysis and interpretation), is preparing to play a key role in the ERS-1 [Earth Resources Satellite] program. The ERS-1 is the ESA's [European Space Agency] remote sensing satellite and will be launched at the end of 1990. Earthnet will provide general services and coordinate the processing and filing of data for ERS-1.

Earthnet's new facilities will allow users to consult the general catalog and the future acquisitions plan. In addition, clients will be able to order products for prompt delivery and request specific observations. The general services, which will remain in operation for most of the next century, could form the basis for a proposed user center for information obtained from observations of the Earth from the polar platform.

Earthnet's activity for ERS-1 will be closely linked to its own network of ground stations and will collect the data transmitted from the satellite when it passes over the covered areas. There are currently three ground stations for data acquisition and processing, in addition to two centers designed to process data from the synthetic aperture radar which will be one of the principal instruments on board ERS-1. The three ground stations, each with very extensive coverage, are: the Fucino-based station at Telespazio which covers Europe, the Middle East, North Africa, and parts of the USSR; Kiruna, in northern Sweden, which ensures the acquisition of data from the North Pole including Iceland, Greenland, and all of Scandanavia, and the Maspalomas station in the Canary Islands, which covers a large part of Western Africa as far as the Gulf of Guinea.

COMPUTERS

Hungarians Develop Defenses Against Viruses

25020009 Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 1 Mar 90 pp 13-15

[Article by Janos Kis: "A Foundation Against Viruses"]

[Excerpts] Virus protection should be available to everyone! This can be realized at an acceptable price only if the costs of developing and operating such systems are covered. In the present situation of the Hungarian economy no one is capable of starting such a program on his own. Use must be made of the support of sponsors and foundations.

After last year's attack of the Friday the Thirteenth virus the New Wave Foundation recognized what a need there was for the protection of domestic computer culture and especially the information stored in the computers. This should be made a public affair just like, for example, the organization of a health service. So they made it possible for the two developers of the PRGDOKI system, Imre Szegedi and Istvan Farmosi, to collect several experts as a nonprofit undertaking and organize and operate the ANTIVIR group within the framework of the foundation. [passage omitted]

The developers have not written their programs for the internationally known viruses. They discovered that unique "viral strains" have developed in Hungary, including subsets entirely unknown abroad. For example, one anonymous domestic program author changed the source code for Friday the Thirteenth so that detectors and killers based on the traditional code elements do not notice it. The situation could be reviewed easily in the first two years, 1987 and 1988, of the appearance of program viruses. Only two viruses spread here, both were so-called file viruses, relatively simple to detect. But last year there was a technological leap. The first members of new virus generations appeared, including virus programs of domestic origin. Indeed, a new type of virus program, the boot virus, introduced itself in our computers. This changes the information in the boot sector to virus code so that blank disks formatted with the infected system can become sources for further infection.

Within the framework of the New Wave Foundation they prepared the PRGDOKI virus protection system which is effective against two versions of the dropping virus, two versions of the reboot virus, Friday the Thirteenth and all its rewrites, the Eddie virus of Bulgarian origin and the new viruses known as Music and Five O'Clock Tea. In the area of boot viruses they have developed protection against the Disk Killer which came in with Disk Manager and the "ping-pong" virus which infects only XT computers. [passage omitted]

They are also developing a preventive program package. The ANTIVIR package will be sold for 2,995 forints. One of their programs effectively frees most applications software of append type viruses. Special auxiliary programs check the integrity of CMOS RAM versions, the boot sector and the partition table; with these, in the event of any illegal change, the earlier pure version can be reloaded.

They have just released their Potomkin program for beta testing. This is memory resident software which prevents the activation of viruses slipping into memory by known means and warns of their presence with a system message. [passage omitted]

At the end of last year, within barely a month and a half, six new viruses appeared in domestic software. So the programmers of the ANTIVIR group had to have a developmental environment with the aid of which they could develop special counter-software against new viruses within a very short time.

We will try to predict at least monthly the expected occurrence of viruses and we ask our readers to inform the secretariat of the New Wave Foundation or the editors if they note a new virus. [passage omitted]

A highly intelligent virus of Soviet origin similar to Eddie has appeared. It is 2,442 bytes long, part stays in memory and erases on every uneven hour. It is active from 0800 to 1600 daily. It has textual and binary identifiers [the following is untranslated, the English text is part of the identifier given; open and close parens are used below in place of the less-than and greater-than signs]:

VICTOR V.1.0 The incredible high performance VIRUS (CR) (LF) Enhanced versions available (CR) (LF) This program was imported from USSR (CR) (LF) Thanks to Ivan. (CR) (LF)

The binary identifier is six bytes after the text: EA 80 49 25 02 2E.

It infects both .EXE and .COM files. For the time being it can be found most reliably by searching for the textual parts. If someone meets up with it put it in "mothballs" and call us so we can develop a killer against it.

Similarly we do not yet have an example of a 3,072 byte virus which appears to infect both .COM and .EXE files. Its binary identifier is F4 F6 2C.

One of our developmental institutes has noted a version of the dropping virus which infects .COM files. Its length and identifier differ from the usual. It is known internationally as Black Jack. (The new PRGDOKI already recognizes it.)

A Tuesday the First version of Friday the Thirteenth has been reported in the country. [passage omitted]

Mutants and New Antidotes

The popularity of a program is indicated by how many people steal it and use it illegally. Hungarian software

rarely suffers this fate. But it appears that PRGDOKI has people envious of it because a number of rewritten versions of it appeared here within a short time. One must watch out for these because they can cause serious damage by damaging files with the .COM extension. [passage omitted]

Because of the ever broader spread of computer viruses the ANTIVIR group of the New Wave Foundation is continuing development of the DOZIS virus killer programs shown at COMPFAIR '89. They have just completed beta testing of PRGDOKI V3.01 and a BOOTKIL program package (that is, a boot-killer killer) which is effective against the two boot viruses which have appeared here so far. The two program systems can be used to kill a total of ten PC viruses. [passage omitted]

PRGDOKI.EXE V3.01 is sold guaranteed free of viruses. It is protected by coding against improper modifications. It takes runable form only in memory. If any of its files are missing or damaged the program exits on its own without causing damage. [passage omitted]

It removes all viruses from a file in a single pass. After starting it first checks to see if the status of the program corresponds to the original status. If not it activates its self-defense virus killer system. [passage omitted]

The ASZSZ Offers Protection

The ASZSZ [State Administration Computer Service], learning from its own problems, formed an internal virus protection system which it has developed further into a service, primarily for users maintaining Novell networks with several hundred computers. [passage omitted]

Their virus protection system, called Protektor, was developed for multi-computer networks and it constantly monitors possible attack points of viruses and by recording changes noted it tries to prevent the spread of the infection. [passage omitted]

The Bodyguard module of Protektor recognizes the presence of about 26 viruses known in Western Europe and registered by IBM and prevents the occurrence of infection. The system does this before memory is loaded. Protection is continuous and remains active from the time the computer is switched on until it is switched off. [passage omitted]

The Archive module of Protektor prepares a databank of applications software so that originals can be stored for a restart after virus removal. [passage omitted]

The system also records who used a program for what work and how long and even tracks the movement of individual program files within the network. This greatly facilitates accounting for institutions providing computer services.

Tektronix Terminal Emulator Developed at Technical University

25020005c Budapest MAGYAR ELEKTRONIKA in Hungarian No 11, 1989 p 64

[Article by Eva Krasznai: "Development of Tektronix Terminal Emulation at the Budapest Technical University"]

[Text] The TEK41EMU terminal emulation software—prepared primarily for the DEC compatible market—makes it possible for a PC/AT to operate like an original Tektronix graphics terminal when connected to a PDP or VAX computer. Most of the presently used PC program packages have many limits—primarily deriving from the PC. These force the user to accept compromises. The TEK41EMU hardware option was developed to bridge over these ominous limits and create complete compatibility with the original Tektronix terminal in both services and power.

The striking development by the process control faculty of the Budapest Technical University is the Tektronix 41113/15/25/11 graphics terminal emulation for PC/AT computers. In the near future INNOTEC, the Technical University Innovation Park, will be marketing this development.

CAD/CAM programs running on PDP and VAX computers with graphics terminals operate only with the above mentioned types of terminals. But these terminals can be obtained abroad at most frightful prices, and some fall under the embargo. So it was necessary to emulate the special graphics terminal services with software, based on a cheap, traditional PC/AT.

For terminal emulation the traditional PC/AT is supplemented by a high resolution card (1280 x 1024, 1024 x 768, 640 x 480) depending on model, with an appropriate RGB monitor, mouse and tablet.

The emulation software which can be loaded from disk offers complete compatibility with the services and surfaces of the original TEK terminals.

Its most important characteristics are the following.

Picture screen list management: segment management (definition, erase, transform, copy, visibility, etc.), software ZOOM and PAN operations can be performed in the 32 bit mode. There is also a possibility for multi-window operation, to define several graphics windows in which different pictures can be found. Alphanumeric and graphics characters: the more developed versions can also operate as a DEC VT 100 terminal. The terminals support multi-window applications. The graphics characters are implementations of the GKS standard "stroke" precision characters. The bit planes of the raster memory can be partitioned to so-called surfaces. The visibility and priority of these surfaces and the interaction of the colors which can be found on the various surfaces can be defined by the user. This possibility is especially useful in designing printed circuits

and IC's, where different surfaces can represent the various layers. The 8 bit-plane versions can show the combined role of 256 colors. The RGB, CNY or HLS system are suitable for definition of the "look up" table. One can also give flashing colors. The direct operations which can be performed with raster memory include writing, reading and copying. These can be used in image processing.

Real-Time Kernel for Microcomputer Systems

25020007 Budapest MERES ES AUTOMATIKA in Hungarian No 6, Nov-Dec 89 pp 328-332

[Article by Dr Karoly Kondorosi and Dr Zoltan Laszlo, of the process control faculty of the Budapest Technical University: "UNIRT, a Real-Time Kernel for Special Purpose Microcomputer Systems"]

[Excerpts] There is a class of microcomputer systems which can be characterized by the following properties: fixed, constant functions; real-time, environment dependent operation; moderate performance requirements; and multiprocessor architecture. Efficient system models must be used when designing such systems despite the cheap, simple device set used in this category. The real-time kernel described in this article could be a standard component of such systems, facilitating the implementation of software designed on the basis of the process model. [passage omitted]

In a future publication, being prepared, we will describe another important component, the communications subsystem.

In general a real-time kernel is the kernel of a real-time operating system, the lowest software layer built onto the hardware. The minimal function set realized by it is the following: task management, synchronization, time management, and memory management.

Because of the multiprocessor hardware architecture it would seem obvious to use a multiprocessor real-time kernel. Taking into consideration the properties of this system class it seemed to us most appropriate to use in every processor the same type of single processor kernel, and we developed an appropriate communications system. [passage omitted]

We reviewed (unfortunately only on the basis of documentation, articles and advertisements) a few real-time operating systems which have been realized (e.g., VERSADOS, iRMX86, etc.). Our goal was to write a simpler and smaller real-time kernel—UNIRT, a universal real-time kernel. [passage omitted]

In accordance with our decision the only synchronization tool for the kernel is a binary semaphore linked with single byte information exchange. The semaphores themselves are static objects to be defined at time of preparation. They have two states: open and closed. There is a priority waiting line for every semaphore.

We selected the following primitives to manage the semaphores:

Reset (S): without any additional action the S semaphore is set to closed.

Signal (S, P): this sets the S semaphore to open and transfers the P parameter. If there are tasks in the waiting line for S then the one with the highest priority becomes active and the semaphore will again be closed.

Wait (S, P): (We indicate the outgoing parameter by underlining.) If the semaphore is open the calling task gets the P parameter transferred at last opening, this runs without waiting and the semaphore becomes closed. If the semaphore is closed the calling task goes into a waiting state, enters the waiting line for S, and the scheduler of the kernel goes into operation, selecting a new active task for running.

Test and Reset (S, P, R): this examines the state of the S semaphore and signals it back in R. If it is open it also gives back the last parameter and sets the semaphore to closed. This primitive is useful when a task wants to proceed through the semaphore and, if it is closed, it does not want to wait.

The initial values of the semaphores must be given at the time of preparation. The single, uniform synchronization tool significantly simplified the kernel and resulted in a clean structure and terse code.

Selecting the best scheduling algorithm was an interesting and essential problem. The literature dealing with real-time operating systems generally recommends priority, preemptive scheduling in the interest of ensuring a short response time for high priority functions. In our opinion preemptive scheduling has a few significant disadvantages. [passage omitted]

Our final conclusion was that since hard real-time requirements pertain to the majority of the functions—that is, the response times must be guaranteed in every case independent of the load conditions—we must scale for the worst case and there is no substantial difference between the two types of limitation. On the basis of this we decided for a non-preemptive scheduling algorithm.

Measuring real time is a basic requirement in real-time systems. In the interest of this it is necessary to have, in every case, a hardware clock providing a periodic interruption.

In the UNIRT kernel we linked timing to semaphore management. We selected the following primitives:

Start Delay (S, t): this starts a time measurement and returns. After the passage of time t the kernel will automatically execute a Signal (S, Pt) operation. Pt is the value of an indicated parameter which identifies the activity given during timing.

Stop Delay (S): this erases the timing started for the S semaphore earlier. [passage omitted]

For convenience we also realized a compound operation: Waitlimit (S, t, P), which starts a timing of value t for S and the calling task begins to wait for S.

Although the tasks are static objects it might be useful to provide a dynamically distributed area for them in RAM memory (for example, to provide work areas, etc. for them).

The area to be treated dynamically must be defined at the time of preparation. The tasks can make use of the area with a Mem Request (L, A, t, R) operation—L gives the size required, t is a time limit for satisfying the request and R indicates back whether it can be satisfied (OK, insufficient memory, time-out, etc.). If the signal back is "OK" then "A" contains the initial address of the area received. If the task no longer needs the dynamic area received it must give it back to the kernel with a Mem Release (A) operation. [passage omitted]

The present specifications for UNIRT developed after numerous earlier experiments employing task management, scheduling and interrupt philosophies.

The first implementation of these specifications was prepared in i8085 assembly language. It proved to be a most terse and efficient implementation. The size of the code of the kernel is under 1 Kbyte. A similarly simple and efficient communications subsystem was built on the kernel; this realizes a rationally limited mailbox mechanism on duplex, point-point connections. We used the kernel and the communications sybsystem in a matrix table control system (with six loosely connected processors) which we put into operation in Cairo.

There was also another i8086 assembler language implementation. We are now working on a C language version with minimal machine code inserts and on an application in a data collection system based on a Z-80 processor.

FACTORY AUTOMATION, ROBOTICS

Robot Arm With Two Degrees of Freedom for Every Joint

25020005a Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 16 Nov 89 p 7

[Article: "Texys at Flexys"]

[Excerpts] The Flexarm small industrial robot waving the flag at the stand of the Flexys Company drew visitors. The special feature of the kinematic chain of the robot—one which gives a chance for its sale on Western markets as well—is that unlike the generally used types today every joint of it has two degrees of freedom, that is they can twist and turn, so it is capable of complex spatial movements. It can be used for assembly, painting and gluing, to serve CNC machines and for instruction.

Flexys, illustrating cooperation with an Italian partner, introduced a PC compatible industrial computer called PICO. [passage omitted] Hardware from the American company Creative Engineering controls the high resolution, real-time image processing system called Texys. On the basis of images of material passing under the camera at one meter per second—for example, textiles, paper, leather, metal or plastics—the computer recognizes every visible fault and even marks the material with an appropriate auxiliary device. [passage omitted]

LASERS, SENSORS, OPTICS

Hungarian Laser Device for 3-D Data Acquisition

25020008 Budapest MERES ES AUTOMATIKA in Hungarian No 6, Nov-Dec 89 pp 354-358

[Article by Dr Laszlo Vajta, of the process control faculty of the Budapest Technical University: "A Vision System for the Combined Evaluation of Intensity and Distance Images"]

[Excerpts] Spatial, 3-D, sensing and the processing of the data obtained are key problems for the successful use of industrial vision systems. The slow acquisition speed puts a limit on the use of equipment which has been developed. The article provides a brief review of spatial sensing procedures and then describes a fast and precise vision system based on lasers. It operates with the new double synchronized scanning principle and under favorable conditions produces a complete image in under one second. There is a description of a fast evaluation procedure based on the physics of the structured light procedure which makes simultaneous use of distance and intensity data. [passage omitted]

At the process control department of the Budapest Technical University, in cooperation with the Institute of the Karlsruhe University and the Computer Sciences Research Institute working with it, we have been dealing with the development of 3-D measurement systems since 1983. The result of this research is a laser vision system which performs a combined evaluation of the intensity and distance images and which uses a new scanning procedure based on so-called double synchronization. [passage omitted]

Using a new way of conducting the ray our system uses the Rioux method (M. Rioux, "Laser Range Finder Based Upon Synchronized Scanners," Applied Optics, Vol. 23, No. 21, Nov. 1984) for two-dimensional scanning. We have named this method double synchronization and its operation can be followed in Figure 5. [not reproduced]

[Figure 5 shows the following track of the ray: from the laser to a mirror turning on a horizontal axis; from there to a fixed mirror; from there to a mirror turning on a vertical axis; from there to fixed mirror; from there to the target object; from there to a fixed mirror; from there again to the mirror turning on a vertical axis, but this time reflected from the other side; from there again to

the mirror turning on a horizontal axis; from there to a fixed mirror; from there through the optics; and from there to the detector.]

After focusing the light from a 20 mW laser diode falls on a mirror with a divided surface. The light reflected on one of the surface elements and deflected in a perpendicular vertical direction to the base line goes to one side of the horizontally deflecting mirror [the one turning on a vertical axis] and then, reflected from a fixed mirror, falls on the object to be measured. Synchronized in accordance with the Rioux method the reflected light is conducted to the second segment of the vertically deflecting mirror [the one turning on a horizontal axis and the first mirror mentioned above]. On this surface the position of the light point will be nearly independent of the angle of deflection. In addition a change in distance causes a change only in the x direction, so a one dimensional sensor (a CCD line detector is recommended) can be used; the resolution of this is entirely responsible for evaluating distance.

The speed of the system is influenced by the number of pixels in the distance image, the quantity of light coming in and the number of shadow points. The time to record an image with 256^2 elements is typically a few seconds. The spatial resolution is the result of a number of compromises. A mathematical analysis of the sensor is beyond the scope of this article but it can be seen that increasing the spatial resolution decreases the depth of field. In our system, with an object distance of 1500 mm and a depth of field of 200 mm we wanted to achieve a resolution of 0.2 mm; in the case of a base distance equivalent to 300 mm this could be achieved with a 256 element detector. (Because of the way the ray is conducted the actual sensor size is only about 120 mm.) The output signal of the CCD sensor is evaluated by hardware which provides a blooming compensated position value. A separate photodetector measures the intensity of the reflected light; we store its signal after quantization together with every single distance pixel. We also put a traditional CCD camera in the system. The task of the camera, located in the optical center, is to record a passive intensity image to permit extended evaluation of the shadow areas.

The entire sensor is controlled by a processor system based on a Motorola 68,000. Its tasks include pacing the deflection, computing the distance values and compensating for distortions (e.g. paralax, cushion distortion, etc.). The geometric parameters of the system can be set with the aid of a self-calibrating procedure based on pictures of reference planes placed at known distances. [passage omitted]

Structured light procedures appear to be promising methods for making three-dimensional vision systems. A double synchronized laser scanner makes possible precise and fast data acquisition even in an industrial environment. The combined evaluation of intensity and distance data appears to be a successful procedure for increasing the computing speed of volumetric characteristics. Its sensitivity to textural changes is especially advantageous in solving surface quality control tasks.

We want to build a new system using our experiences thus far. The sensor itself will operate on a similar principle but a special hardware processor will increase the speed of the evaluation. The system may be working in 1990.

SCIENCE & TECHNOLOGY POLICY

R&D Plans of Hungarian Ministry of Industry

25020004 Budapest FIGYELO in Hungarian
8 Feb 90 p 9

[Interview by Erzsebet Eller with Peter Reiniger and Istvan Danyi: "The Technical Development Theses"]

[Text] The Ministry of Industry has worked out guiding principles—instead of central programs as in earlier guidance practice—with the aid of which enterprises can make use in a more centralized manner of the money which can be turned to research and development. Our interview is with Peter Reiniger, deputy minister of industry, and Istvan Danyi, chief of the technical development main department.

Eller: You say that it is not utopian today to talk about longer range technical development in Hungary even though in reality our industrial enterprises are capital poor and have no money, not even for tomorrow much less the future? For example, the leaders of the BEAG [Budapest Electroacoustics Factory] reported recently in our paper that although stepping up development would be a rational step for a firm which is almost operating at a loss they can spend even less than before, because of the forced costs reductions, on wages for their engineers and equipment for their laboratories.

Reiniger: In many respects that is true, but I must argue with this approach. A country which imports half of its energy and the great majority of its raw materials simply has no alternative for economic development than better use of the existing resources, manufacturing products with a higher degree of processing. And this requires research and development and original ideas in-so-far as possible. The most timely theme today is bringing in foreign capital because, among other things, money is needed for development. But why should a capitalist invest here? What comparative advantages does he see or expect? Naturally he sees the cheap labor force (unfortunately) and the market situation, for 240 million people live in a radius of 600 miles around Budapest and this is a market size comparable even with the United States. But the real attractive force could be the developmental achievements which already bring or promise significant profit. I am thinking, for example, of the original products of the pharmaceutical industry.

Danyi: Each year industry spends 16 or 17 billion forints on technical development. One third of this comes from

central sources, and this ratio has not changed for years. This comes to 1.5-2 percent of the gross production of industry, which is actually very little. I do not like these comparisons either. The problem is not primarily that the developed countries spend many times this on development but rather that if we financed many fewer goals than we put forward earlier then more, by orders of magnitude, could go to individual themes, out of the same amount of money. The other fundamental problem in connection with this is that this sum covers the developments only up to a certain level and when we should be thinking about implementing the developmental achievements then the frantic search for sources begins—for the necessary investments for example.

Eller: So who has the task of centralizing and rationally distributing the sources? Certainly the Ministry of Industry has an important role in seeing whether the money is frittered away or spent purposefully.

Reiniger: Naturally. And that is why I would like to talk about the ideas we have developed—with the aid of a broad expert base—for the enterprises and entrepreneurs in the period after 1990. We are not talking about programs or a five-year plan so no one should expect that, in a manner similar to the recent past, I will be listing dozens of central development goals and the sums allocated to them. We are approaching technical development in a new way, professionally and methodologically. So we are concentrating primarily on development of the technical development infrastructure (the materials, technologies, energy sources, etc.). The chief developmental directions formulated by us affect not individual areas but rather several areas. We would like to give the entrepreneurs room to move for two or three years and get developments from research closer to industrial introduction. In regard to method we give the advantage to banking methods, as opposed to bureaucratic guidance.

Danyi: We start every initiative from the entrepreneurial side. So we do not say, for example: "Enterprise, auto manufacture is a driving branch so you should develop the manufacture of auto parts." Rather we would like to satisfy entrepreneurial needs with technical development.

Eller: So what are the new programs, or "theses" if your prefer, formulated by the Ministry of Industry?

Danyi: We have designated seven chief developmental directions for the period after 1990 and, naturally, we have not attached any concrete goals to these. The chief directions are: research and development in the area of tools, systems and applications for informatics, for information technology; research and development in the area of tools, systems and applications for automation; research and development in the area of preparations and technologies which are original at the international level; research and development in the area of tools and applications for biotechnology; research and development in the area of new materials and manufacturing methods and the tools for them; energy management; and, finally, the spread of environment-friendly production cultures.

The task for the near future is to use sources for these chief directions as a bank or fund would, to develop tactics for financing. In addition we decided which goals are most important, because of the present situation of the economy, the areas on which research and development must be brought to bear. Such goals include encouraging undertakings, improving exportability, aiding reorientation, increased participation in the international division of labor, education and further training, and environmental protection, environmental management and rational conservation of energy and materials. These are the priorities when announcing and judging competitions.

Eller: So it will continue to be possible to get central sources for technical development by means of competitions?

Reiniger: As I said already, we want to develop the financing system with banking methods or banking information. We announce the developmental goals in open competitions, ensuring sectoral and organizational neutrality.

Danyi: But the central technical development fund (the KMUFA) will also continue to be a unique financing source for implementation of the chief R and D directions. Within the frameworks of legal regulation the utilization of the KMUFA will become many-colored. In addition to support type financing there may be loans offered with varying conditions, participation in the undertaking with base capital and so forth. And the enterprise's own sources and credits will contribute to this.

Eller: Let us take one of the above goals, expansion of international contacts. When hearing this many people will think of the cooperation agreements of CEMA, which are bankrupt and have become primarily consumers of paper and ink....

Reiniger: Do we want to compete on the world market? We will have a chance to do so only if we also participate in developmental projects. So we are not talking about international research and development agreements when we emphasize cooperation. We are talking, for example, about the virtually incalculable significance of the fact that "people from Tungsram are working in the laboratories of General Electric and engineers from GE are working in the Tungsram laboratories." It is increasingly true today that research and development in some areas requires so much equipment and so many people that it can be done only in international cooperation. And making use of the results of research and development means more than the market of an individual country. The investments pay off only if we think of marketing on a world scale.

Eller: You have decided that in the future you will start from the entrepreneurial needs in implementing the chief central directions. In the last December issue of FIGYELO we wrote about undertakings of the KFKI [Central Physics Research Institute], essentially that the institute was active as an entrepreneur only in a very narrow area and that its basic activities were still characterized by traditional administrative guidance. To what extent can their example be generalized?

Danyi: Research institutes have not found and will not find work in an innovation poor environment. That is why they scratch around and get into services and small series production according to their own interests, things which do not require a scientific foundation. In my opinion this is a very unfavorable trend.

Reiniger: The branch of industry research institute network which developed in the 1950's has become completely ossified while the industrial structure has changed significantly. In the 1970's the research institutes became so-called developmental enterprises but this did not result in an organization interested in introducing the R and D results. Today, here, a research institute is not profitable because it has world famous patents but rather because it is dealing with one-time or small series manufacture. The KFKI is a good example of this. It has interests on the computer engineering market but it does not cooperate with, let us say, Videoton but rather they compete with one another in an unhealthy way. And the competition does not start with even conditions! You will be ashamed to publish that at the Hungarian developmental enterprises the per capita added value is 200,000, a maximum of 500,000 forints per year. This is nonsense. There are some small undertakings—such as Muszertechnika [Instrument Technology], Mikrosystem or Compudrug—which stand out with their achievements light years above that structure from which they grew....

Eller: This proves that it is not knowledge which is lacking but rather environmental motivation. What is your opinion about privatizing the research and development sites?

Reiniger: It would be difficult to change the earlier structure by privatization but such steps were taken successfully by the Electric Industry Research Institute and the synthetics industry and instrument industry research institutes are conducting similar talks. The question is complicated because on the one hand by privatizing research and development the national income might be sucked out of the country most effectively. So we are afraid of it. But on the other hand—and so we come back to the original question—we need outside capital and intellectual and organizational renewal in this area too, perhaps here most of all.

TECHNOLOGY TRANSFER

Hungarian Computer Company Exploits Byways

25020006 Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 11 Jan 89 pp 9-10

[Interview by Gyorgy Csanyi with Imre Nemeth: "Dataplan's Circles"]

[Excerpts] The meteorological satellite systems of the Dataplan Computer Technology Small Cooperative indicate the weather precisely. So it fits that the leaders of the undertaking know which way the wind is blowing. They try to follow the chief currents of development, in order to avoid storms. We asked president Imre Nemeth about the past, present and plans of this organization, which has navigated so successfully so far.

Csanyi: How did it begin?

Nemeth: I was working in another small cooperative when the computer experts of the Hungarian People's Army looked us up and asked for a bid to service their medium category computers. At that time Videoton performed the service, they wanted to raise the price and the army wanted to reduce costs. Our answer was to form Dataplan, in 1983. [passage omitted]

In the course of our service activity we noted various problems which we tried to solve with devices we developed ourselves. For example, we built onto the Videoton computers operating memory of twice the capacity, on one card. [passage omitted] We also saw that no one within the ESZR [Uniform Computer Technology System] program had succeeded in manufacturing really reliable magnetic disk units and this greatly reduced the efficiency of medium category computers. With the aid of equipment developed by us we fitted Winchesters used in PC systems to the socialist computers. This was a real success here and in the Soviet Union. [passage omitted]

About that time the English subsidiary of the American firm Quest was shipping various CAD/CAM systems, software and peripherals to the Soviet Union. But because of the unreliability of the magnetic disk units made by the Bulgarians or other CEMA members the complete computer systems assembled from the above did not work properly. Quest contacted us through the OMFB [National Technical Development Committee]. The Winchester subsystem developed by us was just what they needed. We quickly agreed that they would provide the Winchester for the subsystem and we would provide the parts we had developed. This was good business because we were able to sell our single card interface for 3,000 pounds—one could buy three PC/AT's together with Winchesters for this amount of money. We now sell our Winchester subsystem independently of Quest also, to Hungarian, Czechoslovak and Soviet customers. [passage omitted]

Another example is connected with the export of measurement data collection systems to the Soviet Union by the Lorand Eotvos Geophysical Institute. The system is used on ships, where fixed head disk units work for only a very brief time because of the vibration of the ship engines. We replaced these with special electronic disk units and we are now working on fitting these to larger ESZR computers.

A third example involves the Soviet postal system. They bought from Alcatel the manufacturing rights for a telephone exchange controlled by a 32 bit computer. An institute in Leningrad was to adapt them but they were not happy with the replacement for the French five megabyte fixed head disk unit. We prepared an electronic version of this, an emulation. Since then we have been an OEM shipper for the telephone exchange manufacturing enterprise built in Ufa. The French disk unit would have cost them 40,000 dollars while ours costs them only 59,000 rubles. Year before last our deliveries to Ufa came to only half a million rubles, this year they will come to four million rubles.

And finally our best known device, thanks to television, the meteorological artificial satellite receiver system which consists of a parabolic antenna, outside and inside receivers and a processing unit. We have manufactured only a few of them; after Chernobyl the army bought one, one is used for traffic control at the Ferihegy airport and an artificial satellite receiver system made by us is also used in the Dushnok ice storm protection system. [passage omitted]

Csanyi: The great majority of your systems go to ruble accounting export. How do you solve the trade, accounting and quota problems?

Nemeth: Primarily by barter. For example, from the Soviet Union we get 5 kopek electric power, synthetic basic materials, rail delivery possibilities and ginseng roots. From Czechoslovakia we get chemicals, Pilsen beer, construction materials and men's coats. The essential thing is to get something which can be sold here or shipped on to the West. Sometimes we ship on the quotas of other Hungarian firms which cannot meet their quotas.

Here is a typical example. We get black-white TV's from the Soviet Union which we then sell to North Korea, from which we get electronic elements of capitalist origin in exchange and we deliver these to the Czechs for goods which can be sold in the West. [passage omitted]

Csanyi: How do you see your future?

Nemeth: We won the Paks Nuclear Power Plant competition to modernize the measurement data collection system for blocks 1 and 2. We are getting 38 million forints for the work, which will last two years. And the payments will be adjusted to the value of the Swiss franc. [passage omitted]

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